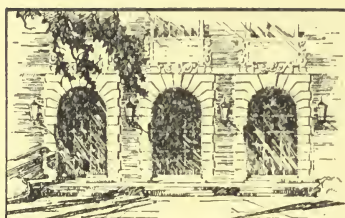


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VOL. V — FRANCIS — HORTEN

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VOLUME V.

F R A

FRANCIS I. (1494-1547), king of France, son of Charles of Orleans, count of Angoulême, and Louisa of Savoy, was born at Cognac. He married Claude, daughter of Louis XII., in 1514, and succeeded him on the throne January 1, 1515. After his accession the first and great object that occupied his ambition was the recovery of Milan, the inheritance of which he claimed through his great-grandmother Valentina Visconti. Milan surrendered, and a treaty was concluded between Francis and the Swiss, which subsequently took the form of a perpetual alliance. In 1516, he compromised the long dispute with the popes by superseding the Pragmatic Sanction of Bourges by a "Concordat," an act which, while it recognized the superiority of the pope over the councils, and gave him the command of the *annates* and other rich sources of revenue, intrusted the French monarch with the power of nominating to vacant benefices. In 1517 he entered into an alliance with the emperor Maximilian and Charles I. of Spain against the Turks; and in 1518 he made an arrangement with Henry VIII. of England, by which France bought back Tournay.

On the death of Maximilian in 1519, Francis became a candidate for the imperial crown; but chiefly through the recommendation of Frederick the Wise of Saxony, the choice fell on Charles I. of Spain, from that time known as Charles V. War between Charles and Francis could scarcely have been avoided, even if the materials for kindling it had not been already prepared; but inherited disputes in regard to Navarre, Milan, Burgundy, and Arles would in any case have sooner or later rendered an appeal to the decision of the sword almost inevitable. With a view to such possibilities, the great aim of both was to secure the alliance of Henry of England and the pope, and here fortune again ultimately smiled on Charles. Francis, elated by his previous achievements on the battlefield, and chagrined at the overthrow of his hopes of obtaining the imperial crown, was naturally eager to strike the first blow; and the request of Henry II. of Navarre to aid him in regaining

his kingdom came opportunely to second his wishes. Accordingly, in April, 1521, he sent an army to the aid of Henry. Charles at once retaliated by an invasion of France, and in May concluded a treaty with Pope Leo X. for the expulsion of the French from Italy. Navarre after being almost won was again lost by Henry; and in Italy the French, chiefly through the blunders of Lautrec, the brother of the king's mistress, lost Milan, Genoa, and all their conquests with the exception of the stronghold of Cremona; but the attempt of the imperialists to enter France was pushed back, and Francis, following in pursuit, only by unaccountable negligence missed the opportunity of inflicting a crushing defeat on Charles between Cambray and Valenciennes. After this, difficulties continued to thicken round the French king; on January 9, 1522, the papal throne was mounted by Adrian VI., who had formerly been tutor to Charles V., and in May Henry VIII. declared war against France; in August, 1523, a coalition was formed against her which included the pope, the emperor, the king of England, the archduke of Austria, the duke of Milan, and the principal Italian republics; and about the same time Charles Constable Bourbon, having been unjustly used by Louise of Savoy, withdrew from France, and offered his sword to Charles V. The Spanish troops crossed the French frontiers at Bayonne; the English entered Picardy, and advanced to within eleven leagues of Paris; and after the repulse of the French army dispatched against Milan, the imperialists passed over into Provence and laid siege to Marseilles. Through cautious but stubbornly defensive tactics, however, both the Spanish and English incursions were foiled, and Francis was thus able to advance to the relief of Marseilles with a large army. The imperialists did not wait his approach; but, determined on retaliation, he crossed the Alps and laid siege to Pavia, where a strong Italian force had taken refuge. Here he was attacked, February 24, 1525, by a relieving army under Bourbon and Pescara. His army was speedily either cut down or dispersed in flight, and he himself

after a desperate attempt to rally, was made prisoner and conveyed by Charles to Madrid. He only regained his liberty, February 21, 1526, by signing a treaty whereby he ceded to Charles both Burgundy and Milan. Its stipulations were guaranteed by the retention of his two sons in the emperor's hands; but he nevertheless resolved to disregard it, and in this he was supported by Pope Clement VII. and also by Henry of England, whom jealousy and alarm at the emperor's success had induced to change sides. Though formal war was not declared, a French army was dispatched to Italy, but the supineness with which the campaign was prosecuted enabled the imperialists to have it all their own way; and an army of mercenaries under Bourbon, who perished in the assault, marching unopposed to Rome, captured and sacked the city, and took the pope prisoner. On this Francis and Henry at once declared war against the emperor; but the army sent into Italy under Lautrec almost melted away before the walls of Naples; and Genoa, by suddenly declaring for the emperor, completed the ruin of the French cause in Italy. The pope soon thereafter saw it to be his interest to be reconciled with Charles; and in August, 1529, Charles and Francis agreed to the treaty of Cambray, by which Francis retained Burgundy and obtained by a ransom the release of the French princes, but renounced his claims in Italy and ceded Artois and Flanders to his rival. He also agreed to fulfill the promise entered into at Madrid to marry Eleanor of Portugal, sister of Charles, his first wife having died in 1524. During the years of peace that followed this treaty, Francis, though he had encouraged the Smalkald League in Germany, persecuted with great vigor the adherents of Protestantism in his own kingdom; but when war was again declared, he issued an edict of toleration. The pretext for the renewal of the war was the murder of the French ambassador by Duke Sforza of Milan in 1533, but hostilities were delayed till 1535, when, emboldened by the weakened condition of the emperor after his war against the Turks, Francis overran Savoy and took possession of Turin. His advantages were, however, followed up with so little energy that Charles, after driving the French out of Italy, began an invasion of Provence; and his progress was only checked by the barbarous destruction of the country before him by Anne of Montmorency. Meantime Francis attacked Flanders, and entered into an alliance with Sultan Soliman II., whose invasion of Hungary induced Charles in 1538 to consent to the ten years' truce of Nice. In 1540 Charles, while the guest of the French monarch, held out to him the hope of a complete satisfaction of his wishes through the investiture of the duke of Orleans with the duchy of Milan; but the promise, if definitely made, was never fulfilled, and Francis, finding a favorable opportunity after the disastrous issue of the emperor's expedition against Algiers, renewed on a flimsy pretext the war in 1542. An offensive alliance was formed with the Turks, the duke of Cleves, and Denmark and Sweden; separate armies attacked at various points the Spanish, Flemish, and Italian frontiers; and the united French and Turkish forces captured and burned Nice. The monotony of the indecisive conflict was relieved in April, 1544, by a brilliant French victory at Ceresole, but the success came too late to permit of its being followed up by an advance into Italy; for in the July following, the emperor from Champagne and the king of England from Picardy were marching to join forces before the walls of Paris. The siege of Boulogne by the English gave Francis, however, sufficient time to make a show of defense such as convinced Charles of the doubtful nature of the enterprise; and without consulting the king of England he sent to

Francis from Crespy terms of peace, which were signed September 17th. By this treaty France retained Burgundy and resigned its claims on Flanders, Artois, and Naples, while the duchy of Milan was promised to the duke of Orleans on his marrying one of the imperial princesses—an arrangement, however, which his death in 1545 rendered nugatory. For some time afterward the English king continued the war in Picardy, but a treaty of peace was signed in June, 1546. As soon as peace was concluded with the emperor, the persecution of the Protestants in France was renewed, and in 1545 an edict was passed for the expulsion of the Waldenses from Provence. The health of Francis had for several years been completely undermined, and he succumbed to an acute attack of disease, May 31, 1547.

FRANCIS II. (1543-1560), king of France, eldest son of Henry II. and of Catherine de' Medici, was born at Fontainebleau, January 19, 1543. He married the famous Mary Stuart, daughter of James V. of Scotland, April 25, 1558, and ascended the French throne July 10, 1559. He died in 1560.

FRANCIS I., head of the Holy Roman Empire, the eldest son of Leopold, duke of Lorraine, was born on December 8, 1708. His full name was Francis Stephen. At the age of fifteen he was sent to Vienna, where he received the Silesian duchy of Teschen. In 1735, in return for Lorraine, which Charles VI., at the end of the war of the Polish succession, gave to Stanislaus Leszczynski, Francis Stephen obtained the reversion to the duchy of Tuscany, to which he succeeded in 1737. He was elected emperor after the death of Charles VII., and crowned at Frankfurt on October 4, 1745. He suddenly died at Innsbruck on August 18, 1765, falling into the arms of his second son Leopold, who succeeded him as duke of Tuscany, and ultimately (after the death of Joseph II.) became emperor.

FRANCIS II., the last Holy Roman Emperor, and, as Francis I., first emperor of Austria, was born in Florence on February 12, 1768. He was the son of the emperor Leopold II., after whose death, in 1792, he succeeded to the hereditary dominions of the house of Austria, being crowned emperor in the same year. He was immediately involved in the first of his famous wars with France, in which, till 1795, he had the support of the king of Prussia. He was compelled, mainly in consequence of the victories of Napoleon, who pressed northward from Italy into Carinthia, to conclude, on October 17, 1797, the treaty of Campo Formio, whereby the empire lost the greater part of the left bank of the Rhine, and Austria had to give up the Netherlands and Lombardy. Austria received in return Venetia, Friuli, Istria and Dalmatia. In 1799 war broke out afresh, the emperor having on this occasion England and Russia as allies. During the first campaign the French were everywhere defeated; but in the following year Napoleon gained the brilliant victory of Marengo, while Moreau was equally successful at Hohenlinden. The shock of these two battles made it impossible for Austria to continue the war, and on February 9, 1801, she concluded the treaty of Lunéville, which confirmed that of Campo Formio, besides exacting fresh sacrifices. France now obtained the whole of the left bank of the Rhine. Once more in association with Russia and England, the emperor began another war with France in 1805. The capitulation of Ulm and the battle of Austerlitz, great as were these disasters, did not make the case of Austria hopeless, for she still had large forces; Russia was willing to continue the war, and the power of France had been seriously crippled at Trafalgar. But Francis was dispirited, and craved peace. On December 25, 1805, was concluded the treaty of Presburg, which deprived Austria of Venetia and Tyrol

In 1806, after the formation of the Confederation of the Rhine, he formally resigned the imperial crown, thus bringing to an end the Holy Roman Empire and the kingdom of Germany. Forgetting the true meaning of the word emperor, he had in 1804 proclaimed himself, as Francis I., hereditary emperor of Austria; and this title has been retained by his successors. He took no part in the war of Prussia with France in 1806, but after some time began to make preparations for a determined struggle, by which he should regain all the advantages lost in previous wars. The new conflict broke out in 1809, and the whole of Germany awaited the result with intense anxiety. Austria was unfortunate at first; but the highest hopes were excited by her thorough victory of Aspern. It was followed by the battle of Wagram, which enabled Napoleon to dictate peace from the palace of Schönbrunn, where he had once before taken up his quarters. By the treaty of Schönbrunn (October 14, 1809,) he transferred the allegiance of about 4,000,000 of Austrian subjects to other rulers; but as in the following year he married Maria Louisa, the eldest daughter of Francis, it seemed probable that the two sovereigns would in future be on friendly terms. Francis was the ally of Napoleon in his war with Russia in 1812; and when, after the retreat from Moscow, France found herself confronted by Russia and Prussia, Austria at first remained neutral, and in the summer of 1813 acted as mediator. In August of the same year she joined the allies; and, like the sovereigns of Prussia and Russia, Francis accompanied his troops in the war which followed. The settlement of Europe which resulted from the final defeat of Napoleon made Francis a more powerful sovereign than he had been at the beginning of his reign; and from this time forward he lived at peace, except that he had to put down a rising in Lombardy in 1821. Francis was married four times, having by his second wife, Maria Theresa, princess of Sicily, thirteen children. He died March 2, 1835, and was succeeded by his son Ferdinand.

FRANCIS, St., a well-known saint of the Roman Catholic Church, the founder of the great order of Franciscans, was born at Assisi in the year 1182. Francis found his vocation, not only in a life of entire devotion and poverty for himself, but in founding an order of mendicants devoted to the service of the church. This was about the year 1208 or 1209, when, therefore, the saint was about twenty-six years of age. He was henceforth a preacher as well as an exemplar of poverty. He essayed to reproduce the picture of the divine life on earth, having not where to lay his head, going about doing good, and preaching the gospel of the kingdom. Gradually there gathered round his cell, which he had fixed outside the town, near a little church, the St. Maria degli Angeli, better known as the Portiuncula, a band of disciples as enthusiastic as himself.

In this insignificant manner was laid the foundation of the Franciscan order. At first there were only seven, himself the eighth, but all were animated by the same spirit, and all followed the same rule of life.

Francis founded an order of poor sisters as well as poor brothers, known by the name of Poor Clares or Clarisses. The origin of the sisterhood is encircled in a halo of romance, such as everywhere surrounds the footsteps of St. Francis. Clara was a young lady of the neighborhood, who, either attracted by the saint's preaching, or enamored of his life of poverty, or both, resolved to devote herself to self-sacrifice, as he and his companions had done. He is said to have "poured into her ears the sweetness of Christ." The result was that she forsook her home, fled to the Portiuncula, and, being first a member of the order, was then placed in a

female convent. From this questionable beginning sprang the sisterhood nearly as famous in its history as the great brotherhood, and which survives till this day. There was a third order also sprung up in the course of the saint's lifetime. So marvelous were the consequences of his preaching that whole populations, it is said, wished to devote themselves to consecrated poverty. But many, of course, had no real vocation to such a service, and Francis, visionary as he was, saw that the excesses of his system might prove its ruin. So he arranged to receive persons of this class into an order of what was called Tertiaries or Brethren of Penitence, who retained their social position and their customary employments in the world, while coming under general vows to abstain from worldly dissipations, such as the theater, and otherwise to be scrupulous in all their conduct. Women were not admitted to this order without the consent of their husbands. Its members did not wear silk or other costly materials, but they had no special costume, and otherwise were at liberty. His conduct in this matter is sufficient to prove that, amidst all the apparently childlike enthusiasm of the saint, he possessed, as indeed cannot be doubted, no inconsiderable vein of shrewd discernment and of practical ability. This order was established in 1221. St. Francis, worn out by his many labors and consuming zeal, died October 4, 1226.

FRANCIS BORGIA, St. (1510-1572), duke of Gandia, and afterward general of the Jesuit order, was the son of John, duke of Gandia, a scion of the well-known family of Borgia, or Borja, to which Popes Calixtus III. and Alexander VI. had belonged, and of Joanna of Aragon, daughter of Alphonso, a natural son of Ferdinand the Catholic. He was born at Gandia (Valencia). His death took place at Rome. He was beatified by Urban VIII. in 1624, and canonized by Clement X. in 1671, his festival being afterward (1683) fixed by Innocent XI. for October 10th.

FRANCIS, St., OF PAOLA (1416-1507), founder of the order of Minims, was born of humble parentage at Paola in Calabria. His education appears to have made very little progress until he reached his thirteenth year, when, in accordance with a vow, he was taken by his father to the Franciscan convent of San Marco in Calabria. Here he learned to read, and distinguished himself by his austerities; but at the close of a probationary year he, for some reason that is not mentioned, left San Marco, and, after a pilgrimage to Assisi and Rome, retired to the neighborhood of his native town, where in a cave by the sea-shore he gave himself wholly to a hermit life, after the example of the great St. Francis, having no bed but the bare rock, and no other food than the herbs which he gathered in the neighboring wood, or which were sometimes brought to him by his friends. In the course of time he was joined by some others like-minded with himself, and the building of a chapel in 1436 is generally considered as marking the first beginning of the Minimite order. The death of Francis took place in his ninety-first year at Plessis. He was canonized by Leo X. in 1519 — his day in the calendar being April 2d (Duplex).

FRANCIS, St., OF SALES (1567-1622), bishop of Geneva, and a well-known devotional writer of the Roman Catholic Church, was born at the Chateau de Sales, near Annecy in Savoy. In 1598 Francis was appointed coadjutor bishop of Geneva, and became the official companion, as he had long been the warm friend, of Claude de Garnier, the aged bishop who had fostered his talents and largely shaped his career. Some years after this, in 1602, he spent some time in France and especially in Paris, where his preaching attracted great crowds, and his influence was felt from the court

of Henry IV. to the poor sisters at Port Royal. In 1608 Francis published his best known and most valuable work, the *Introduction à la Vie Dévote*, the circulation of which was immense. Both as a preacher and as a writer a certain overweening "sweetness" may be said to be his marked characteristic—a sweetness at times not without duplicity and a taint of cold-blooded fanaticism. He died in the end of 1622, and was canonized in 1665.

FRANCIS, SIR PHILIP, a conspicuous Whig politician, and even apart from his supposed connection with the *Letters of Junius*, a powerful pamphleteer, was born in Dublin, in 1740. In 1761 he became personally known to Pitt, who, recognizing his ability and discretion, once and again made use of his services as private amanuensis. In 1762 he was appointed to a principal clerkship in the war office, and in the same year he married Miss Macrabie, the daughter of a retired London merchant. He is known to have written for the *Public Ledger* and *Public Advertiser*, as an advocate of the popular cause on many occasions about and after the year 1763; he frequently attended debates in both Houses of Parliament, especially when American questions were being discussed; and between 1769 and 1771 he is also known to have been favorable to the scheme in which Calcraft and others were engaged for the overturn of the Grafton government and afterward of that of Lord North, and for persuading or forcing Lord Chatham into power. In January, 1769, the first of the *Letters of Junius* appeared, and the series was continued till January 21, 1772. They had been preceded by others under various signatures, which, however, are all attributed to one and the same hand.

In January, 1772, the office of deputy secretary in the war office became vacant, and the post was offered by Lord Barrington to Francis, who declined it. In July of the same year he left England for a tour through France, Germany and Italy, which lasted until the following December. On his return he was, according to an autobiographical fragment which has been preserved, contemplating emigration to New England, when, in June, 1773, Lord North, on the recommendation of Lord Barrington, appointed him a member of the newly constituted supreme council of Bengal, at a salary of £10,000 per annum. He returned to England in October, 1781. In the general election of April, 1784, Francis was returned by the borough of Yarmouth, Isle of Wight. On this occasion he took an opportunity to disclaim every feeling of personal animosity toward Hastings. This did not prevent him, however, on the return of the latter, in 1786, from doing all in his power to bring forward and support the charges which ultimately led to the impeachment resolutions of 1787. The acquittal of Hastings in April, 1795, disappointed Francis of the governor-generalship, and in 1798 he had to submit to the additional mortification of a defeat in the general election. He was once more successful, however, in 1802, when he sat for Appleby. Though re-elected for Appleby in 1806, he failed to secure a seat in the following year; and the remainder of his life was spent in comparative privacy. In 1814 he married his second wife, Miss Emma Watkins, who long survived him, and who has left voluminous manuscripts relating to his biography. He died on December 23, 1818.

FRANCISCANS. The Franciscan orders include the three orders of the Minorites, and all the less important associations who trace their rule to Francis of Assisi. The three orders of the Minorites, or Franciscans proper, include (1) the Minorite friars, properly so called, under a succession of generals of the whole order from the foundation; (2) the order of the Poor Ladies

or Poor Claras—the Franciscan nuns; (3) the order of Penitent Men and Women, which includes (a) all those who dwell in Franciscan cloisters and keep the third rule, (b) those who live in cloisters of their own, keeping the third rule, and (c) the Tertiaries properly so called. All these three orders of Friars, Nuns and Tertiaries are more or less under the jurisdiction of the general minister of the Franciscan order.

The rule originally prescribed by St. Francis was very strict, and, rigidly enforced, would have made all the members of the order pious beggars. This was the founder's idea, but when the order became popular it was found that few of its members could act up to its requirements; and even in the lifetime of the founder attempts were made to relax them. The relaxations sanctioned by the decrees of popes and by general usage were repeatedly fought against by small but zealous minorities, and these struggles gave rise to various divisions in the order. Since the time of Leo X. and his union built these divisions have been reduced to three—the Observants, the Conventuals and the Capuchins—all of whom belong to the first order of the Franciscans; and they are the survivors of a much more numerous division. The Observants are supposed to keep the rule of Francis with some strictness, and they take the first rank among the Franciscans; their minister general has pre-eminence. The Conventuals follow the rule of Francis with certain relaxations permitted by successive popes. Their general has to be confirmed by the great minister general, but otherwise they are independent. Since 1528 the Capuchins have had an independent general under the minister general.

The Franciscan soon became one of the most important of the mediæval monastic orders. It had a peculiar character, and attracted minds of the sympathetic mystical cast. This led to its curious connection with many of the mediæval heretical sects. The Franciscan theology was also peculiar. It had the same Pelagian characteristics that distinguish the modern Jesuit theology, which has done little more than develop the Franciscan ideas on the immaculate conception, the doctrines of freedom and grace, etc. During the Middle Ages the Franciscans, however, furnished many strong opponents to the papal theology and ecclesiastical claims. The order has produced a long array of distinguished theologians and churchmen—Bonaventura, Alexander Hales, John Duns Scotus, and William of Occam were all Franciscans. Wadding, the great historian of the Franciscans, has filled a folio volume with names of distinguished members of the order.

FRANCISQUE. Jean François Millet (c. 1644–1680), commonly called Francisque, was born at Antwerp, and is generally classed among the painters of Flanders, on account of the accident of his birth. He was received a member of the Academy of Painting at Paris, in 1673, and, after gaining consideration as an imitator of the Poussins, he died in 1680, bequeathing his art and some of his talents to one of his sons.

JEAN FRANÇOIS MILLET, the younger, was born in Paris, and was made a member of the Academy of Painting at Paris in 1709. He died in 1773.

FRANCK. The name of Franck has been given indiscriminately but improperly to painters of the school of Antwerp, who belong to the families of Francken and Vranex (see FRANCKEN and VRANEX). One artist, truly entitled to be called Franck, is Gabriel, who entered the guild of Antwerp in 1605, became its president in 1636, and died in 1639. Gabriel Franck taught a great number of pupils, among whom we notice Abraham Genoels the elder, and Laurent Franck, the master of Francisque. None of his works are now to be traced.

FRANCK or FRANK, SEBASTIAN (c. 1500–1543)

not unfrequently called by the Latinized form of his name, *Francus*, an important German writer of the Reformation period, was born at Donauwörth.

FRANCKE, AUGUST HERMANN, an influential German philanthropist and theologian, was born 1663 at Lübeck. He graduated at Leipsic in 1685, but, having found employment as a "privat-docent," did not quit the university until the end of 1687. He next passed a number of months at Lüneburg as assistant or curate to the learned and pious superintendent Sandhagen, and there his religious life was remarkably quickened and deepened. On leaving Lüneburg, he spent some time in Hamburg, where he was engaged as a teacher in a private school, and there also he considered himself to have acquired some experience which proved invaluable in after life. After a long visit to Spener, who was at that time in Dresden, and who encouraged him in the plans he had formed, he returned to Leipsic in the spring of 1689, and began to give Bible lectures of an exegetical and practical kind, at the same time resuming the *collegia philobiblica* of earlier days. He rapidly became very popular as a lecturer; but the peculiarities of his teaching almost immediately aroused a violent opposition on the part of the university authorities; and, before the end of the year, he was, on the ground of his alleged pietism, interdicted from lecturing. Thus it was that Francke's name first came to be publicly associated with that of Spener, and with one of the most fruitful church movements of the seventeenth century. Prohibited from lecturing in Leipsic, Francke, in 1669, found work at Erfurt as "deacon" of one of the city churches. Here his evangelistic fervor attracted multitudes to his preaching, but at the same time excited the jealousy of his less zealous colleagues as well as the antipathy of the Catholic section of the population; and the result of their combined opposition was that, after a ministry of fifteen months, he was, in September, 1691, banished from the town by the civil authorities. The same year witnessed the expulsion of Spener from Dresden. In December, Francke received and accepted an invitation to fill the chair of Greek and Oriental languages in the new university of Halle, which was at that time being organized by the elector Frederick III. of Brandenburg; and at the same time, the chair having no salary attached to it, he was appointed minister of the parish of Glaucha, in the immediate neighborhood of the town. Here, for the next thirty-six years, he continued to discharge the two-fold office of pastor and professor with rare energy and success. He died at Halle on June 8, 1727.

FRANCKEN. Eleven painters of this family cultivated their art in Antwerp during the sixteenth and seventeenth centuries. Several of these were related to each other, while many bore the same Christian name in succession. Hence unavoidable confusion in the subsequent classification of paintings not widely different in style or execution. When Franz Francken the first found a rival in Franz Francken the second, he described himself as the "elder," in contradistinction to his son, who signed himself the "younger." But when Franz the second was threatened with competition from Franz the third, he took the name of "the elder," while Franz the third adopted that of Franz "the younger." It is possible, though not by any means easy, to sift the works of these artists.

FRANÇOIS DE NEUFCHÂTEAU, NICOLAS LOUIS, COUNT (1750-1828), a French statesman and poet, was born at Saffais, in the district of Meurthe. He had very multifarious accomplishments, and interested himself in a great variety of subjects, but his fame rests chiefly on what he did as a statesman for the encouragement and development of the industries of

France. His maturer poetical productions did not fill the promise of those of his early years, for though some of his verses have a superficial elegance, his poetry generally lacks force and originality. He had considerable qualifications as a grammarian and critic, as is witnessed by his editions of the *Provinciales* and *Pensées* of Pascal, Paris, 1822 and 1826, and *Gil Blas*, Paris, 1820. He is also the author of a large number of works on agriculture.

FRANCONIA, in German, FRANKEN, a name of very different application in different historical periods. It properly signifies the land of the Franks, and is, consequently, identical in original meaning with the word Francia, or France. In the beginning of the fourth century the Frankish territory stretched from the Loire eastward to the basin of the Rhine and the Main; but it was shortly afterward broken up into two divisions—Austria, Francia Orientalis, or the kingdom of the East Franks, and Neustria, Francia Occidentalis, or the kingdom of the West Franks. As time went on both kingdoms extended their boundaries; and when the treaty of Verdun, in 845, settled the claims of the grandsons of Charles the Great, there was a kingdom of Western France with Latin tendencies, and a kingdom of Eastern France with Teutonic tendencies, each possessing a central district or duchy of its own name. These districts were separated from each other by the district of Lotharinga or Lorraine. The western was soon after lost sight of; but the eastern continued for a long period to be the very core and kernel of the German kingdom, and a theory became prevalent that it was the original seat of the Franks in Germany. Under the Saxon and Franconian emperors it was subdivided into Ost-Franken, Francia Orientalis, or Eastern Franconia *par excellence*, and Rhein-Franken, Francia Rhenensis, or Rhenish Franconia. The former, which was also distinguished as Saal-Franken, stretched from the Fichtelgebirge and the Rhine to the Danube, and from the Upper Palatinate to the Spessart and the lands of the Neckar; while the latter was the country between the Spessart and the Rhine, and included the present district of Frankfurt-on-the-Main. Though the name frequently occurs in our histories, there was probably no proper "duchy" of Franconia, in the same sense at least as there was a duchy of Saxony or a duchy of Bavaria. Both Eastern Franconia and Rhenish Franconia were broken up into a number of distinct territories—countships, lordships, etc. When Maximilian divided Germany into circles, in 1501, he gave the name of Franconia to the circle which included the bishoprics of Würzburg, Bamberg, and Eichstädt, the district of Mergentheim belonging to the grand master of the Teutonic Order, the territory of the abbey of Schönbach, the principalities of Baireuth and Ansbach, the countships of Henneberg and Schwarzenberg, the territories of the curia of Franconian counts, the imperial towns of Nuremberg, Rothenburg, Schweinfurt, Weissenburg, and Windsheim. Altogether the circle comprised sixty-nine territories, and had an area of about 10,430 square miles, and in 1790 its population amounted to 1,547,000. The name of Franconia ceased to be officially used after the dissolution of the German empire, in 1806; but in 1837 King Louis I. of Bavaria gave the names of Upper, Middle, and Lower Franconia to what had previously been known as the circles of the Upper Main, the Rezat, and the Lower Main. Upper Franconia forms the northeast portion of Bavaria, and is partly conterminous with the frontiers of Bohemia, Saxony and Prussia.

FRANEKER, a town of Holland, province of Friesland, is situated ten miles west of Leeuwarden, on the canal between that town and Haarlingen.

FRANKENBERG, an important manufacturing

town of Saxony, circle of Zwickau, is situated on the Zschopau, seven miles northeast of Chemnitz.

FRANKENHAUSEN, a town of Germany, principality of Schwartzburg-Rudolstadt, is situated on the Little Wipper, thirty-six miles north-northeast of Gotha. Population (1900), 5,600.

FRANKENSTEIN, a town in the Prussian province of Silesia, government of Breslau, is situated thirty-five miles south by west of the town of that name.

FRANKENTHAL, a town in the Rhenish district of Bavaria, is situated on the Isenach, nine miles northwest of Mannheim, and is connected with the Rhine by a canal four miles in length. Population, 8,000.

FRANKFORT, a city of the United States, capital of Franklin county and of the State of Kentucky, is picturesquely situated on both sides of the Kentucky river, on a space of elevated ground bounded by a bluff 150 feet high. It is distant twenty-nine miles west-northwest from Lexington, and sixty-five miles east from Louisville, by rail. The river is crossed at Frankfort by two bridges, and that portion of the town lying on the south side of the river is known as South Frankfort. The principal buildings are the State house, a marble building with a handsome portico supported by Ionic columns, the institution for imbecile children, the State penitentiary, the county court house, and the public hall. The beautiful cemetery contains the remains of Daniel Boone, the pioneer of Kentucky, who died September 20, 1820. Frankfort has distilleries and flour and cotton mills, and a considerable trade in lumber. The river is navigable for steamers forty miles above the city. Frankfort was laid out in 1787, and became the capital of the State in 1792. Population, (1900), 9,487.

FRANKFORT, a city of central Indiana, the county-seat of Clinton county, is on three railway lines, and is surrounded by a fine farming country. The city contains a court-house, six churches, high and graded schools, two national banks, three elevators, furniture factories, planing mills, etc. Natural gas is utilized for fuel and manufacturing purposes. One daily, one semi-weekly, and three weekly papers are published. Frankfort is a considerable shipping point, and had a population in 1900 of 7,100.

FRANKFORT-ON-THE-MAIN; German, **FRANKFURT** or **FRANKFURTH-AM-MAIN**, one of the principal cities of the German empire, in the circle of Wiesbaden, in the Prussian province of Hesse-Nassau, and till 1866 one of the four free cities of Germany. The position which it occupies is one of no small natural beauty in the broad and fertile valley of the Main, its northern horizon being formed by the soft outlines of the Taunus range. The surrounding country is richly clad with orchard and forest, and in the season of spring especially presents a prospect of indescribable luxuriance.

The principal ecclesiastical building in Frankfort is the cathedral of St. Bartholomew's, which is situated not far from the river between the Domplatz on the north and the Weckmarkt on the south. Of the secular buildings in Frankfort perhaps the most characteristic is the Rathhaus or Römer, which, by a strange coincidence, bears a name suggestive of, though not derived from, its principal historical associations. It was here, in the Wahlzimmer or election room, that the electors or their plenipotentiaries decided the choice of the emperors.

Frankfort has always been much more of a commercial than an industrial town, and at present it manufactures little else but Frankfort black, waxcloth, jewelry, gold and silver thread, tapestry and such like articles. The city has long been famous as one of the principal banking centers of Europe; and throughout the city there are now over 220 banking offices. The

so-called "Frankfort Bank" was founded in 1854, with a capital of 10,000,000 gulden.

Frankfort has been the birthplace of not a few of the most celebrated men of Germany. J. G. Schlosser the historian, Feurbach the philosopher, Kirchner the scholar and naturalist, Clement Brentano, Bettina von Arnim, and Ludwig Börne, are all in the list; but what the city considers its highest literary distinction is the fact that Johann Wolfgang Goethe was born in 1749 at No. 23 Hirschgraben.

Of memorial monuments the largest and most elaborate in Frankfort is that erected in 1858 in honor of the early German printers. It was modeled by Ed. von der Lausitz and executed by Herr von Kreis.

The present municipal constitution of the town dates from 1867, and conforms to the Prussian system. Including the suburban villages (Bornheim 10,685, Bockenheim 13,043, Oberrad 4,609, and Rödelheim 3,903), the total population (1900), was 288,489.

FRANKFORT-ON-THE-ODER; German, **FRANKFURT-AN-DER-ODER**, a town of Germany at the head of a government in the Prussian province of Brandenburg, about fifty miles in an easterly direction from Berlin. The university of Frankfort, which was founded in 1506 by the elector of Brandenburg, Joachim I., was removed to Breslau in 1811. The population, which in 1849 was 29,969, had at the census of 1900 attained to 61,835.

FRANKINCENSE, or **OLIBANUM**, a gum-resin obtained from certain species of trees of the genus *Boswellia*, and natural order *Burseraceae*. From the frequent employment of frankincense in the sacrifices of the ancients, shown by numerous passages in their prose and poetic writings, it is evident that the trade in that substance must formerly have been very extensive. Frankincense, or olibanum, occurs in commerce in semi-opaque, round, ovate, or oblong tears or irregular lumps, which are covered externally with a white dust, the result of their friction against one another. Its fumes are an excellent insectifuge. As a medicine it was in former times in high repute. Pliny mentions it as an antidote to hemlock. Avicenna recommends it for tumors, ulcers of the head and ears, affections of the breast, vomiting, dysentery, and fevers. Dr. Delioux, of Toulon, considers its curative properties equal to those of other balsamic medicines, and that for cheapness it is preferable for hospital use to the balsams of Peru and Tolu, and, being more agreeable to the stomach, to tar. As a fumigating agent, he advocates its employment in bronchitis and chronic laryngitis. In the East frankincense has been found efficacious as an external application in carbuncles, blind boils, and gangrenous sores, and as an internal agent it is given in gonorrhoea. In China it was an old internal remedy for leprosy and struma, and is accredited with stimulant, tonic, sedative, astringent, and vulnerary properties. Its stimulant action appears to be directed chiefly to the mucous surfaces of the body.

Common Frankincense, or Thus, is the term applied to a resin which exudes from fissures in the bark of the Norway spruce fir; when melted in hot water and strained it constitutes "Burgundy pitch." The concreted turpentine obtained in the United States by making incisions in the trunk of a species of pine, *Pinus australis*, is also so designated. It is commercially known as "scrape," and is similar to the French "galipot" or "barras." Common frankincense is an ingredient in some ointments and plasters, and on account of its pleasant odor when burned, has been used in incense as a substitute for olibanum. The "black frankincense oil" of the Turks is stated by Hanbury to be liquid storax.

FRANKLIN. See FREEHOLD.

FRANKLIN, the county seat of Venango county, Pennsylvania, is situated at the junction of French creek and the Allegheny river, on four lines of railway. The river is navigable here at high-water. The manufactories of the city number thirteen, among which are foundries and machine shops, four oil refineries and two flour mills, the latter run by water power from French creek. Franklin contains eleven churches, high and graded schools valued at \$50,000, and a city hall costing \$30,000. There are five banks, and one daily and two weekly newspapers. Population (1900 census), 7,317. The city is lighted with gas, has a good sewerage system, and water-works supplying pure spring water. Fire and police departments are maintained. The city receipts from May 1, 1889, to May 1, 1890, were \$24,282.52.

FRANKLIN, BENJAMIN. There are those who, with a full understanding of his remarkable career, regard Benjamin Franklin as the greatest American. He was the embodiment of the genius of common sense. He is the darling of American biography. He was journalist, author, diplomatist, statesman, financier and philosopher, and is he who, at the age of 43, when the dreams and enthusiasms of youth were gone, conceived the idea, perhaps the most sublime that has entered into the heart of man, of drawing the lightning from the heavens. He alone at the moment knew that lightning and electricity were identical, or understood how the fact might be demonstrated by simple and childish means; but should all other services be forgotten, and the details of a splendid career pass into oblivion, by this will he be remembered. The June afternoon in 1749, the passing showers, the kite, the string and the key. The manifest foolishness of the act would have excited ridicule, and he went alone.

He had no idea of pecuniary profit to accrue. He wrote of his discoveries to a friend in London. The Royal Society ridiculed them, only to afterwards apologize and acknowledge when all others had done so. All his long life he was engaged in a ceaseless but untruffled search for the reason why. There was no subject that did not attract his attention. He invented the musical glasses. He made a successful stove. He made a table of the conductivity of heat in metals. He studied the Gulf-Stream. As an author he wrote everything but poetry, and as a philosopher he studied everything but theology. A tallow-chandler's son, a working printer, an apprentice who was whipped by his elder brother even after he was competent to edit that brother's newspaper, a toiler and wage-earner from early youth, he yet stood among princes, was the ablest diplomatist America ever produced, and ere he died the best known, the most highly-honored, and the best-beloved old man in the old world and the new. With these facts in view the details of his career, given meagerly here of necessity, may be more appreciatively examined.

He was born in the city of Boston, and in the colony of Massachusetts Bay, on January 17, 1706. In his eighth year Benjamin, who never could remember when he did not know how to read, was placed at school, his parents intending him for the church. In his tenth year he was taken from school to assist his father, in the business of tallow-chandler and soap-boiler. In his twelfth year he was apprenticed to his elder brother James, in the printing business. In 1720-21 James Franklin also started a newspaper, the second that was published in America, called *The New England Courant*. The relations of the two brothers, however, gradually grew so inharmonious

that Benjamin determined to quit his brother's employment and leave New England. He sold some of his books and with the proceeds, in October, 1723, he found his way to the city of Philadelphia, where, 400 miles from home, at the immature age of seventeen, without an acquaintance, and with only a few pence in his pocket, he was fortunate enough to get employment. Keith, the governor of the province, took him under his patronage, and proposed to start him in business for himself, and to give him the means of going to England and purchasing the material necessary to equip a new printing office. Franklin embraced the governor's proposal, and took passage for London, but on his arrival there found that he had been made a dupe of by Keith. He readily found employment and continued to work until July 23, 1726, when he again set sail for Philadelphia in company with a Mr. Dunham, who offered him employment in a mercantile house. Only a few months after Franklin's return to Philadelphia, the death of Mr. Dunham put an end to his career as a merchant. While awaiting something more favorable, he was induced by large wages to return to his old employer Keimer. This led to his making the acquaintance of a bright young man named Meredith. He was learning the printer's art, and offered to furnish the capital to establish a new printing office—his father being a man of some means—if Franklin would join him and direct the business. This proposal was accepted, the types were sent for, a house was rented at £20 a year, part of which was sublet to a glazier who was to board them, and before the expiration of a year from his return to Philadelphia, Franklin, for the first time in his life, was in business for himself.

Almost simultaneously, in September, 1729, he bought for a nominal price the *Pennsylvania Gazette*, a newspaper which Keimer had started nine months before to defeat a similar project of Franklin's which accidentally came to his knowledge. It had only ninety subscribers. Franklin's superior journalism, his new type, some spirited remarks on a controversy then waging between the Massachusetts assembly and Governor Burnet (a son of the celebrated Bishop Gilbert Burnet) brought his paper into immediate notice, and his success, both as a printer and as a journalist, was from that time forth assured and complete. During the next seventeen years, he was at the head of journalism in America. In 1731 he established the first circulating library on the continent; in 1732 he published the first of the *Poor Richard's Almanacs*, a publication which was continued for twenty-five years, and attained a marvelous popularity. The annual sale was about 10,000 copies, at that time far in excess of any other publication in the colonies, and equivalent to a sale at the present time of not less than 300,000. In the next ten years he acquired a convenient familiarity with the French, Italian, Spanish and Latin languages.

In 1736 Franklin was chosen a clerk of the general assembly, and was reelected the following year. He was then elected a member of the assembly, to which dignity he was reelected for ten successive years, and was appointed one of the commissioners to treat with the Indians at Carlisle. In 1737 Colonel Spotswood, then postmaster-general, appointed him deputy postmaster at Philadelphia. About this time he organized the first police force and fire company in the colonies, and a few years later initiated the movements which resulted in the foundation of the university of Pennsylvania and of the American Philosophical Society, in the organization of a militia force, in the paving of the streets, and in the foundation of a hospital. It was

during this period, and in the midst of these very miscellaneous avocations, that he made the discoveries in electricity which have secured him undisputed rank among the most eminent of natural philosophers. He was the first to demonstrate that lightning and electricity are one. The Royal Society, when an account of his experiments, which had been transmitted to a scientific friend in England, was laid before it, made sport of them, and refused to print them. Through the recommendation of his friend they were printed, however, in an extra number of the *Gentleman's Magazine*, of which the publisher ultimately sold five editions. A copy chancing to fall into the hands of Buffon, he saw their value, and advised their translation and publication in France, where they immediately attracted attention. The "Philadelphia experiments," as they were called, were performed in the presence of the royal family in Paris, and became the sensation of the period. The Royal Society of London found it necessary to reconsider its action, published a summary of the experiment in its *Transactions*, and, as Franklin afterward averred, more than made him amends for the slight with which it had before treated him, by electing him an honorary member, exempting him from the customary payments, and sending him for the rest of his life a copy of the *Transactions*. Since the introduction of the art of printing, it would be difficult to name any discovery which has exerted a more important influence upon the industries and habits of mankind.

In consequence of complications arising from legislation affecting the taxation of the colonies Franklin was sent to England to petition the king for redress of their grievances. There he remained five years.

During this sojourn of five years in England, Franklin made many valuable friends outside court and political circles, among whom the names of Hume, Robertson and Adam Smith are conspicuous. In the spring of 1759 he received the degree of doctor of laws from the Scottish university of St. Andrews.

On October 25, 1760, King George II died, and his grandson ascended the throne. A clamor for peace followed. Franklin was for a vigorous prosecution of the war then pending with France.

Franklin sailed again for America in August, 1762, after an absence of five years, during which he had found an opportunity of visiting large portions of the continent, and of acquiring information about European affairs both in and out of England, which made him more than ever an enlightened and trustworthy authority in America upon all foreign questions affecting the interest of the colonists. The peace with the proprietary government was only temporary. The question of taxing their estates had come up in a new form, and finally resulted in a petition from the assembly drawn by Franklin himself for a change of government for Pennsylvania. The election which took place in the fall of 1764, turned upon the issue raised in this petition, and the proprietary party succeeded, by a majority of twenty-eight votes out of 4,000, in depriving Franklin of the seat to which he had been chosen for fourteen successive years in the provincial assembly. The victory, however, was a barren one, for no sooner did the assembly convene than it resolved again to send Franklin as its special agent to England to take charge of their petition for a change of government, and to look after the interests of the province abroad. On November 7th, following his defeat, he was again on his way across the Atlantic. We may as well here say at once that the petition which he brought with him for a change of government came to nothing. Franklin presented it,

and the Penns opposed it; but matters of so much graver consequence continually arose between 1765, when it was presented, and 1775, when the revolution began, that it was left to the final disposition of time. The Penns at last had the sagacity to sell betimes what they were not wise enough to keep. The State of Pennsylvania gave them £130,000 for their interest in its soil, and the British Government settled upon the head of the family a pension of £4,000 a year.

Early in the year of 1764 Grenville, the prime minister, had sent for the agents of the American colonies resident in London, and told them that the war with France which had just terminated had left upon England a debt of £73,000,000 sterling, and that he proposed to lay a portion of this burden upon the shoulders of the colonists by means of a stamp duty, unless the colonists could propose some other tax equally productive and less inconvenient. He directed the agents to write to their several assemblies for instructions upon this point. The assembly of Pennsylvania, which expressed the sentiment of all the colonies, was decidedly of the opinion that to tax the colonies, which were already taxed beyond their strength, and which were surrounded by aboriginal enemies and exposed to constant expenditures for defense, was cruel, but to tax them by a parliament in which they were not represented was an indignity. While such was their feeling, they allowed it to be understood that they would not reject any requisition of their king for aid, and if he would only signify his needs in the usual way, the assembly would do their utmost for him. These views were summed up in a "resolution" thus expressed: "that, as the assembly always had thought, so they always should think, it their duty to grant aid to the crown, according to their abilities, whenever required of them in the usual manner." To prevent the introduction of such a bill as the ministry proposed, and which Franklin characterized as "the mother of mischief," he left no stone unturned, by personal intercession, by private correspondence, and through the press. At last, in despair, he, with his associate agents, sought an interview with the minister. They found him inexorable. The government wanted the money, and it did not wish to recognize the principle upon which the colonists resisted the government method of obtaining it. The bill was introduced, and was promptly passed, only fifty voting against it in the Commons, and the Lords not dividing upon it. The sum expected from this tax being only £100,000, it was thought the colonists would soon be reconciled to it. This was evidently Franklin's hope, which he did his utmost to realize. But when the news of the passage of the Stamp Act reached the colonies, and its provisions came to be scanned, the indiscretion of those who advised it was manifest. Meetings were held in all the colonies, where resolves were passed unanimously to consume no more British manufactures until the hateful Act was repealed. For simply recommending a trusty person to collect the tax, Franklin himself was denounced, and his family in Philadelphia was in danger of being mobbed. The Act not only failed of its purpose in producing a revenue, but before it went into operation a formidable agitation for its repeal had already commenced.

The news of the repeal filled the colonists with delight, and restored Franklin to their confidence and affection. From that time until the end of his days he was, on the whole, the most popular man in America. Franklin, when he went to London in 1764, confidently expected to return in the following

year; but he was not destined to leave England till ten years later, and then with the depressing suspicion that the resources of diplomacy were exhausted. Meantime he remitted no effort to find some middle ground of conciliation. Equipped with the additional authority derived from commissions to act as the agent of the provinces of Massachusetts, of New Jersey, and of Georgia, and with a social influence never possessed probably by any other American representative at the English court, he would doubtless have prevented the final alienation of the colonies, if such a result, under the circumstances, had been possible. But under the pressure of the crown, negotiation and debate seemed rather to aggravate the differences than to remove them. Satisfied that his usefulness in England was at an end, he placed his agencies in the hands of Arthur Lee, an American lawyer practicing at the London bar, and on March 21, 1775, again set sail for Philadelphia. On his arrival collisions had occurred, some two weeks previous, between the people and the royal troops at Concord and at Lexington. He found the colonies in flagrant rebellion, and himself suddenly transformed from a peacemaker into a warmaker.

The two years which followed were among the busiest of his life. The very morning of his arrival he was elected, by the assembly of Pennsylvania, a delegate to that continental congress then sitting in Philadelphia, which consolidated the armies of the colonies, placed George Washington in command of them, issued the first continental currency, and assumed the responsibility of resisting the British government. In this congress he served on not less than ten committees. One of its first measures was to organize a continental postal system and to make Franklin postmaster-general. Thus he was avenged for his dismissal eighteen months before from the office of deputy by being appointed to a place of higher rank and augmented authority. He planned an appeal for aid from the King of the French, and wrote the instructions of Silas Deane, a member of the congress, who was to convey it; he was sent as one of three commissioners to Canada, in one of the most inclement months of the year, on what proved an ineffectual mission to persuade the Canadians to join the new colonial union; he was elected a delegate from Philadelphia to the conference which met on June 18, 1776, and which, in the name of the people of the colonies, formally renounced all allegiance to King George, and called for an election of delegates to a convention to form a constitutional government for the United Colonies. He was also one of the committee of five which drew up the "Declaration of Independence." He was also chosen president of the convention called to frame a constitution for the State of Pennsylvania, which commenced its session on July 16, 1776. He was selected by congress to discuss terms of peace with Admiral Lord Howe, who had arrived in New York harbor on July 12, 1776, to take command of the British naval forces in American waters, and on September 26th, upon the receipt of encouraging news from France, he was chosen unanimously to be one of three to repair to the court of Louis XVI. and solicit his support. His colleagues were John Adams, destined to be Washington's successor in the presidency, and Arthur Lee, Franklin's successor in the agency in London.

Franklin, now in the seventieth year of his age, proceeded to collect all the money he could command, amounting to between £3,000 or £4,000, lent it to congress, and with two grandsons set sail in the sloop of war *Reprisal* on October 27th, arriving at Nantes

on December 7th, and at Paris toward the end of the same month.

At the time of Franklin's arrival in Paris, he was already one of the most talked about men in the world. He was a member of every important learned society in Europe; he was a member, and one of the managers of the Royal Society, and one of eight foreign members of the Royal Academy of Sciences in Paris. Three editions of his scientific works had already appeared in Paris, and a new edition, much enlarged, had recently appeared in London. To all these advantages he added a political purpose—the dismemberment of the British empire—which was entirely congenial to every citizen of France. He became at once an object of greater popular interest than any other man in France—an interest which, during his eight years' sojourn there, seems always on the increase. He animated French society with a boundless enthusiasm for the cause of the rebel colonists, persuaded the government that the interests of France required her to aid them, obtained a treaty of alliance at a crisis in their fortunes in the winter of 1777, when such an alliance was decisive, and the great moral advantage of a royal frigate to convey the news of it to America. A few months later he signed the treaties which bound the two countries to mutual friendship and defense, and on the morning of March 20, 1778, the three envoys were formally received by the king at Versailles, and through them the country they represented was first introduced into the family of independent nations.

In February of the following year General Lafayette, who had distinguished himself as a volunteer in the rebel army, returning to France on leave, brought a commission from the American congress to Doctor Franklin as sole plenipotentiary of the United States to the court of France. From this time until the close of the war it was Franklin's paramount duty to encourage the French government to supply the colonists with money. How successfully he discharged this duty may be inferred from the following statement of the advances made by France upon his solicitation:—In 1777, 2,000,000 francs; in 1778, 3,000,000 francs; in 1779, 1,000,000 francs; in 1780, 4,000,000 francs; in 1781, 10,000,000 francs; in 1782, 6,000,000 francs; in all, 26,000,000 francs. To obtain these aids at a time when France was not only at war, but practically bankrupt, and in defiance of the strenuous resistance of Necker, the minister of finance, was an achievement, the credit of which, there is the best reason for believing, was mainly due to the matchless diplomacy of Franklin.

Franklin had been for some years a martyr to the gout, which, with other infirmities incident to his advanced age of seventy-five, determined him to ask congress, in 1781, to relieve him.

Congress not only declined to receive his resignation, but with its refusal sent him a commission, jointly with John Adams and John Jay, who had been the agent of congress in Spain, to negotiate a peace. Active negotiations with Franklin and his associates were opened, and on November 30th a preliminary treaty was signed by the English and American commissioners; a definite treaty was signed on September 30, 1783, and ratified by congress January 14, 1784, and by the English government on April 9th following. At the conclusion of the preliminary treaty Franklin renewed his application to congress to be relieved, to which he received no answer. A few weeks after signing the definite treaty he renewed it again, but it was not until March 7, 1785, that congress adopted the resolution which permitted "The Hon-

ourable Benjamin Franklin to return to America as soon as convenient," and three days later it appointed Thomas Jefferson to succeed him.

It was on July 12, 1785, that, accompanied by some members of his family and most intimate friends, he set out for Havre on his return to America.

On September 13th, Franklin, who had become by far the most widely known and the most eminent of Americans, disembarked again at the very wharf in Philadelphia, on which, sixty-two years before, he had landed a houseless, homeless, friendless, and substantially penniless runaway apprentice of seventeen. In the month succeeding his arrival he was chosen a member of the municipal council of Philadelphia, of which he was also unanimously elected chairman. He was soon after elected president of Pennsylvania.

At the expiration of his term in 1786, he was unanimously reelected, and again unanimously in 1787. He was also chosen a member of the national convention, of which Washington was a member and president, which met on the second Monday of May, 1787, to frame a constitution for the new confederacy. To the joint influence of Franklin and Washington probably should be ascribed the final adoption of the constitution which this convention framed. Franklin survived his retirement from office two years, which he consecrated almost as exclusively to the public use as any other two of his life, although most of the time the victim of excruciating pain. His pen was never more actively nor more effectively employed.

Franklin died in his own house, in Philadelphia, on April 17, 1790, and in the eighty-fifth year of his age.

When Franklin, the fugitive apprentice boy, in 1723, walked up Market street on the morning of his first arrival in Philadelphia, munching the rolls in which he had invested a portion of the last dollar he had in the world, the curious spectacle he presented did not escape the attention of Miss Read, a comely girl of eighteen years who chanced to be standing in the door of her father's house when he passed. Not long after, accident gave him an introduction to her; they fell in love, and, soon after his return from his trip to England, he married her. By her he had two children, a son who died young, and a daughter, Sally, who married Richard Bache, of Yorkshire, England. Mrs. Bache had eight children, from whom are descended all that are now known to inherit any of the blood of Benjamin Franklin.

Though spending more than half of his life in the public service, Franklin was never for a moment dependent upon the government for his livelihood. With the aid of his newspaper, his frugality, and his foresight, he was enabled to command every comfort and luxury he desired through his long life, and to leave to his descendants a fortune neither too large nor too small for his fame, and valued at the time of his death at about £30,000 sterling.

FRANKLIN, SIR JOHN, rear-admiral, was born at Spilsby, Lincolnshire, April 16, 1786. He received the rudiments of education at St. Ives, and afterward attended Louth Grammar School for two years; but having employed a holiday in walking twelve miles with a companion to look at the sea, which up to that time he knew only by description, his imagination was so impressed that he determined to be a sailor. In the hope of dispelling what he considered to be a boyish fancy, his father sent him on a trial voyage to Lisbon in a merchantman; but it being found on his return that his wishes were unchanged, an entry on the quarterdeck of the *Polyphemus*, seventy-four, Captain Lawford, was procured for him in 1800; and this ship having led the line in the battle of Copenhagen in 1801, young

Franklin had the honor of serving in Nelson's hardest-fought action. Two months after the action of Copenhagen, he joined the *Investigator*, discovery-ship, commanded by his relative, Captain Flinders, and under the training of that able scientific officer, while employed in exploring and mapping the coasts of Australia, he acquired a correctness of astronomical observation and a skill in surveying which proved of eminent utility in his future career. Franklin was on board the *Porpoise* when that ship and the *Cato* were wrecked, August 18, 1803, on a coral reef, off the coast of Australia. After this misfortune, Franklin proceeded to Canton, where he obtained a passage to England in the *Earl Camden*, East Indiaman, commanded by Sir Nathaniel Dance, commodore of the China fleet of sixteen sail. On February 15, 1804, Captain Dance repulsed a strong French squadron, led by the redoubtable Admiral Linois. In this action Franklin performed the important duty of signal midshipman. On reaching England, he joined the *Bellerophon*, seventy-four, and in that ship he was again intrusted with the signals, a duty which he executed with his accustomed coolness and intrepidity in the great battle of Trafalgar. In the *Bedford*, his next ship, he attained the rank of lieutenant, and, remaining in her for six years, latterly as first lieutenant, served in the blockade of Flushing, on the coast of Portugal, and in other parts of the world, but chiefly on the Brazil station, whither the *Bedford* went as part of the convoy which escorted the royal family of Portugal to Rio de Janeiro in 1808. In the ill-managed and disastrous attack on New Orleans, he commanded the *Bedford's* boats in an engagement with the enemy's gunboats, one of which he boarded and captured, receiving a slight wound in the hand-to-hand fight.

On peace being established, Franklin turned his attention once more to the scientific branch of his profession, and sedulously extended his knowledge of surveying. In 1818 the discovery of a northwest passage became again, after a long interval, a national object, and Lieutenant Franklin was appointed to the *Trent*, as second to Captain Buchan of the *Dorothea*, hired vessels, equipped for penetrating to the north of Spitzbergen, and, if possible, crossing the Polar Sea by that route. During a heavy storm both ships were forced to seek for safety by boring into the closely packed ice, in which extremely hazardous operation the *Dorothea* was so much damaged that her reaching England became doubtful; but the *Trent* having sustained less injury, Franklin requested to be allowed to prosecute the voyage alone, or under Captain Buchan, who had the power of embarking in the *Trent* if he chose. The latter, however, declined to leave his officers and men at a time when the ship was almost in a sinking condition, and directed Franklin to convoy him to England. Though success did not attend this voyage, it brought Franklin into personal intercourse with the leading scientific men of London, and they were not slow in ascertaining his peculiar fitness for the command of such an enterprise. It was with full confidence in his ability and exertion that he was, in 1819, placed in command of an expedition appointed to travel through Rupert's Land to the shores of the Arctic Sea, while Lieutenant Parry was dispatched with two vessels to Lancaster Sound. At this period, the northern coast of America was known at two isolated points only, viz., the mouth of the Coppermine River, discovered by Hearne,—but placed erroneously by him four degrees of latitude too much to the north,—and the mouth of the Mackenzie. Lieutenant Franklin, accompanied by a surgeon, two midshipmen, and a few Orkney men, embarked for Hudson's Bay, in June, 1819. His instructions left the route he was to pursue much to his

own judgment, guided by the information he might be able to collect at York Factory from the Hudson's Bay Company's servants there assembled. Wintering the first year on the Saskatchewan, the expedition was fed by the Hudson's Bay Company; the second winter was spent on the "barren grounds," the party subsisting on game and fish procured by their own exertions, or purchased from their native neighbors; and in the following summer the expedition descended the Coppermine River, and surveyed a considerable extent of the sea coast to the eastward. The survivors of this expedition traveled, from their start at York Factory to their return to it again, by land and water, 5,550 miles. While engaged on this service, Franklin was promoted to be a commander, and after his return to England in 1822 he obtained the rank of post captain, and was elected a fellow of the Royal Society. In the succeeding year he married Eleanor, the youngest daughter of Mr. Porden, an eminent architect.

In a second expedition, which left home in 1825 (his wife dying within the same year), Franklin descended the Mackenzie and traced the coast-line through thirty-seven degrees of longitude, from the mouth of the Coppermine River, where his former survey commenced, to near the 150th meridian, and approaching within 160 miles of the most easterly point attained by Captain Beechey, who was coöperating with him from Behring's Strait. His exertions were fully appreciated at home and abroad. He was knighted in 1829, received the honorary degree of D.C.L. from the university of Oxford, was awarded the gold medal of the Geographical Society of Paris, and was elected in 1846 correspondent of the Paris Academy of Sciences.

In 1836 Sir John accepted the lieutenant-governorship of Van Diemen's Land (now Tasmania). His government, which lasted till the end of 1843, was marked by several events of much interest. One of his most popular measures was the opening of the doors of the legislative council to the public.

The colonists showed their remembrance of his virtues and services by sending to Lady Franklin a subscription of £17,000 in aid of her efforts in the search for their former governor, and later still by a unanimous vote of the legislature for the erection of a statue in honor of him at Hobart Town.

Sir John found, on returning to England, that the confidence of the Admiralty in him was undiminished, as was shown by his being offered in 1845 the command of an expedition for the discovery of the north-west passage; this offer he accepted. The prestige of Arctic service and of his former experiences attracted a crowd of volunteers of all classes, from whom were selected a body of officers conspicuous for talent and energy. Thus supported, with crews carefully chosen (some of whom had been engaged in the whaling service), victualled for three years, and furnished with every appliance then known, Franklin's expedition, consisting of the *Erebus* and *Terror* (134 officers and men), with a transport ship to convey additional stores as far as Disco in Greeland, sailed from Greenhithe on May 19, 1845. The ships were last seen on July 26th, in Baffin's Bay by a whaler which was moored to an iceberg in latitude $74^{\circ} 48' N.$ and longitude $66^{\circ} 13' W.$; and at that time the expedition was proceeding prosperously. Letters written by Franklin a few days previous to that date were couched in language of cheerful anticipation of success, while those received from his officers expressed their glowing hope, their admiration of the seaman-like qualities of their commander, and the happiness they had in serving under him.

In 1847, though there was no real public anxiety as to the fate of the expedition, preparations began to be

made for the possible necessity of succoring the explorers. As time passed, however, and no tidings of the expedition reached England, the search began in earnest; expedition after expedition was dispatched in quest of them in 1848 and succeeding years, regardless of cost or hazard. In this great undertaking Sir John's heroic (second) wife took a part which will ennoble her name for all time. Between 1848 and 1854 about fifteen expeditions were sent out by England and America in the hope of rescuing, or at least finding traces of, the missing explorers. Lady Franklin's exertions were unwearying; she exhausted her private funds in sending out auxiliary vessels to quarters not comprised in the public search, and by her pathetic appeals she roused the sympathies of the whole civilized world. Traces of the missing ships were discovered by Ommanney and Penny in August, 1850, and were brought home by the *Prince Albert*, fitted out by Lady Franklin with the especial object of following to the southward the route which would be almost certainly taken by Franklin in carrying out his instructions. It was thus ascertained that the first winter had been spent behind Beechey Island, where they had remained at least as late as April, 1846. No further tidings were obtained until the spring of 1854, when Doctor Rae, then conducting an exploring party of the Hudson Bay Company from Repulse Bay, was told by the Eskimo that (as was inferred) in 1850 white men, to the number of about forty, had been seen dragging a boat over the ice near the north shore of King William's Island, and that later in the same season, but before the breaking up of the ice, the bodies of the whole party were found by the natives at a point a short distance to the northwest of Back's Great Fish River, where they had perished from the united effect of cold and famine. The latter statement was afterward disproved by the discovery of skeletons upon the presumed line of route; but indisputable proof was given that the Eskimo had communicated with members of the missing expedition, by the various articles obtained from them and brought home by Doctor Rae, who, on his return to England, claimed, and succeeded in obtaining, the reward of £10,000 offered by the Admiralty in 1849, "to any party or parties who, in the judgment of the Board of Admiralty, shall, by virtue of his or her efforts, first succeed in ascertaining" the fate of the missing expedition. On account of the information obtained by Doctor Rae, a party in two canoes under Messrs. Anderson and Stewart was in 1855 sent by government down the Great Fish River, and they succeeded in obtaining from the Eskimo at the mouth of the river a considerable number of articles which had evidently belonged to the Franklin expedition; and many others were picked up on Montreal Island, articles evidently belonging to a boat which, it was reported, had been cut up by the Eskimo. This expedition was unable to make so thorough a search as was desirable, but it was clear from the results obtained by it, and from the examinations which had been made by the many other expeditions of all straits and inlets and coasts except the region to the north of Great Fish River, that King William's Island, the west coast of Boothia, and the neighboring sea were the fields likely to yield the most satisfactory results. It was clear that a party from the *Erebus* and *Terror* had endeavored to reach by the Fish River route the settlements of the Hudson Bay Company, and equally evident that the expedition in making a southerly course had been arrested within the channel into which the Great Fish River empties itself. At this time government was wholly taken up with the events in the East, and when the war was over it was deemed useless to spend any more money and risk any more lives in what was regarded as a hopeless quest. But Lady

Franklin's pious devotion to the memory of her noble husband prompted her to make one last effort to ascertain his fate; to this object she dedicated all her available means, aided, as she had been before, by the subscriptions of sympathizing friends, her judgment being confirmed by the opinion of all those best able to form one as to the hopefulness as well as the feasibility of such an attempt. Accordingly, she purchased and fitted out the little yacht *Fax*, which sailed from Aberdeen in July, 1857; the command was accepted by Captain (afterward Sir) Leopold McClintock, whose high reputation had been won in three of the government expeditions sent out in search of Franklin. Having been compelled to pass the first winter in Baffin's Bay, it was not till the autumn of 1858 that the expedition passed down Prince Regent's Inlet, and the *Fax* put into winter quarters at Port Kennedy, at the eastern end of Bellot Strait, between North Somerset and Boothia Felix. In the spring of 1859 three sledging parties went out, Captain (now Sir) Allen Young to examine Prince of Wales Island, Lieutenant (now Captain) Hobson the north and west coasts of King William's Island, and McClintock the east and south coasts of the latter, the west coast of Boothia, and the region about the mouth of Great Fish River. The search was successful so far as ascertaining the course and fate of the expedition is concerned. From the Eskimo in Boothia many relics were obtained, and reports as to the fate of the ships and men; all along the west and south coast of King William's Island remains of articles belonging to the ships were discovered, and skeletons that told a terrible tale of disaster. Above all, in a cairn at Point Victory a precious record was discovered by Lieutenant Hobson that briefly told the history of the expedition up to April 25, 1848, three years after it set out full of hope. In 1845-6 the *Erebus* and *Terror* wintered at Beechey Island on the southwest coast of North Devon, in latitude 74° 43' 28" N., longitude 91° 36' 15" W., after having ascended Wellington Channel to latitude 77° and returned by the west side of Cornwallis Island. This statement was signed by Graham Gore, lieutenant, and Charles F. Des Vœux, mate, and bore date May 28, 1847. These two officers and six men, it was further told, left the ships on May 24, 1847, no doubt for an exploring journey, at which time all was well.

The success of the first year's work, thus briefly stated, was greater than has been since attained within any one season in arctic service. The alternative course permitted by Franklin's instructions had been attempted but was not pursued, and in the autumn of 1846 he followed that which was especially commended to him. But on his attempting to reach the coast of America, the obstruction of heavy ice, which presses down from Melville Island through McClintock Channel (not then known to exist) upon King William's Island, had finally arrested his progress. It must be remembered that in the chart carried out by Franklin, this island was laid down as a part of the mainland of Boothia, and he therefore could pursue his way *only* down its western coast. The record that revealed all which has been briefly stated was written upon one of the forms supplied by the Admiralty to surveying vessels, to be thrown overboard after the required data had been filled in. But upon the margin around the printed form was an addendum dated April 25, 1848, which extinguished all hopes of a successful termination of their grand enterprise. The facts are best conveyed by the terse and expressive words of the record, which is, therefore, given *verbatim*:—"April 25, 1848. Her majesty's ships *Terror* and *Erebus* were deserted on April 22d, five leagues north-northwest of this, having been beset since September 12, 1846. The officers and crews, con-

sisting of 105 souls, under the command of Capt. F. R. M. Crozier, landed here in latitude 69° 37' 42" N., longitude 98° 41' W. Sir John Franklin died June 11, 1847; and the total loss by deaths in the expedition has been to this date nine officers and fifteen men." The handwriting is that of Captain Fitzjames, to whose signature is appended that of Captain Crozier, who also adds the words of chief importance, namely, that they would "start on to-morrow, April 26, 1848, for Back's Fish river." A briefer record has never been told of so tragic a story.

FRANKLIN, THE BATTLE OF. After the Chattanooga campaign had ended, and General Grant had been made commander-in-chief of the Federal armies, General Sherman withdrew his army from Hood's front, and started upon his march to the sea. Lee was confronting Grant at Richmond, and to hold all the country which had been wrested from the Confederacy between the Mississippi and Chattanooga, Sherman had left Thomas with a force only slightly exceeding 20,000 men. These men were scattered at various points in the region indicated, and to operate against them Hood had a force numbering more than twice as many. His army had been re-enforced, and the Confederate Government was contemplating a move on the Ohio, and an invasion of the territory held by the Union troops. In addition to Hood's army Kirby Smith had been ordered to bring up his command from west of the Mississippi, in order to force to a successful conclusion this invasion. The value of a Confederate victory at this time would have been particularly great, as it would, it is believed by many, have had the effect of securing an alliance between the French, who were then occupying Mexico, and the Confederate States—if, indeed, it had not secured the co-operation of other European powers. The bulk of Thomas' army under General Schofield, numbering 18,000 men, was strung out in a line fifty miles in length, reaching from Pulaski to Centerville, on Duck river. General Schofield had received instructions from General Thomas, in the event of Hood's attempt to turn his flank, to fight at Columbia; but if the attack was made in another direction to fight at Pulaski. Between Hood and Nashville the only Union forces were four small cavalry brigades. Thomas' object was to delay Hood until he could concentrate the Union army at some given point and receive re-enforcements both of recruits and of the army in Missouri under the command of A. J. Smith. The outlook for the Federal army was very discouraging; for to add to the seriousness of the situation there was not only a great disparity of numbers, but on account of the scattered condition of Thomas' troops and the number of important posts to be held, it was a work of great difficulty (owing to the state of the weather and condition of the roads) to move troops to any common point. Hood lay on the south bank of the Tennessee in command of the crossing at Florence. He advanced to the north bank, and, pushing forward, forced Schofield back on Columbia, and while feigning a direct attack upon the Union front threw seven divisions of infantry and a heavy force of cavalry over the Duck, and succeeded in attaining the Union rear. The destruction or capture of the Union army seemed certain, but the errors of Hood's division commanders and the determined resistance of General Stanley's (Federal) command enabled Schofield to fall back upon Franklin, to which point he was directed by General Thomas to retire. After crossing the river Hood moved at day-break, with his seven divisions, to Spring Hills, twelve miles in Schofield's rear and on his line of retreat to Franklin. As Hood entered the place from the west General Stanley, with one division of the old army of

the Cumberland came up from the south. Schofield's troops were strung out for a distance of twelve miles, and encumbered with wagon trains. Stanley made a gallant fight from early in the afternoon till 7 p. m., holding the Confederates in check for seven hours, giving Schofield time to bring up his scattered forces. As night fell, however, matters did not seem much better for the Union forces, for there were seven divisions of the Confederate army on its front and flank and two in its rear. But, under cover of Stanley's determined stand, the army succeeded in retreating in safety as far as Franklin, where a stand was made, a portion of the Union army facing about, and where was fought one of the bloodiest battles of the war—all things considered, one of the most remarkable conflicts of the entire four years. The Union forces were posted in a single intrenched line, with only one brigade in reserve, and with two brigades stationed in the open field, covered by a slight breastwork a third of a mile in front of the main line. Their flanks rested on the Harpath river, and the intention was to cover the crossing of the trains, and to hold the enemy in check until night should allow the whole force to withdraw under cover of darkness. When Hood's army came up, it was formed in column of attack, and at once moved down in good order and in overwhelming numbers on the Union position. The two advanced brigades were enveloped and brushed away—forced back over the intrenchments, both armies amalgamating in a confused mass. Federal batteries were seized and turned so as to enfilade the Union lines. Fortunately one of the retreating brigades, as it was driven over the parapet, turned, and firing a volley into the Confederates, manned part of the vacated works. Then the reserve brigade was ordered to charge by its immediate commanding officers, and, although suffering fearfully, drove the Confederates at the point of the bayonet back over the works. The Union guns were retaken and turned on the Confederates with fearful effect. Several times did Hood's charging columns endeavor to dislodge the Federals, but in vain, and when night fell upon the scene Hood had lost over seventeen hundred men killed, including five generals, and four thousand wounded, among whom were six generals. The Union loss was stated to be fifteen hundred.

The remainder of the army having crossed the river by this time, the forces which had been engaged in the conflict were under cover of darkness withdrawn within the defenses of Nashville, where a short time after Hood was totally defeated by Thomas. The date of the battle of Franklin was November 30, 1864.

FRANKS, THE. Frank is, probably, the newest of all German names, and represents, somewhat vaguely, a group of tribes who dwelt about the lower and middle Rhine. The Franks lived in districts previously occupied by tribes bearing other names; nor have we proof of any incursion of a strange tribe called Franks from north or east. The old Frankish legend that they came from the Danube to the Rhine probably arose from the fact that a colony of the Sicambrian cohort was planted by the Romans on the spot where Buda-Pesth now stands. The meaning and origin of the term also lends itself to the view above stated—the words "frank and free," usually grouped together, are in fact the same in origin and meaning.

FRANZEN, FRANS MICHAEL (1772-1847), Swedish poet, was born in Uleaborg in Finland. He died at Säbra parsonage. Franzen was a true lyric poet, fixing with masterly art the fleeting traits of common life in a glorified and fascinating form.

FRANZENSBAD, KAISER-FRANZENSBAD, EGER-BRUNNEN, and formerly **SCHLADAER SAUERLING,** a

well-known Bohemian watering-place which owes its most popular name to the emperor Francis II. It is a little over three miles northwest of Eger, at a height of about 1,500 feet above the sea.

FRASCATI, a town of Italy, in the province of Rome and about ten and a half miles south of the city, with a station at the terminus of a branch railway from the main line between Rome and Naples.

FRASER, JAMES BAILLIE (1783-1856), Scottish diplomatist, traveler, and author, was born in Keelick or Relig, in the county of Inverness. The works by which he attained his literary reputation were accounts of his travels and fictitious tales illustrative of Eastern life. In both he employed a vigorous and impassioned style, which was on the whole wonderfully effective in spite of minor faults in taste and flaws in structure. Some of his tales have not yet altogether lost their popularity.

FRASER, SIMON. See **LOVAT.**

FRASERBURGH, a seaport town of Scotland, Aberdeenshire. Population, 5,000.

FRASER RIVER, the principal river of British Columbia, is formed by two branches, the chief of which rises in the Rocky mountains in 53° 45' N. latitude, and 119° longitude. The branches unite near Fort George, whence the stream flows in a southern direction, and after a course of 800 miles falls into the Georgian Gulf in 49° N. latitude. The salmon fishery is of importance.

FRATRICELLI was a common name given to a number of obscure mediæval sects who flourished in the thirteenth and fourteenth centuries. They were also called Bioschi, Bighini, Bocasoti, Frèrôts, etc., and included such sects as the Brethren of the Full Spirit, the Brethren of the Free Spirit, the Beghards, the Brethren of the Common Life, etc. The history of these mediæval sects is very obscure; but it seems now made out that while they had some relation to and sympathy with the older Cathari and other Manichæan heretics, they had a distinct origin in the Franciscan order, and that their real aim was to carry out the principles of St. Francis even in defiance of the court of Rome.

FRAUD, in law, is a word of wide import, to which it is difficult to assign any exact definition. The courts have in fact deliberately refrained from defining it, because they did not wish to limit their power of dealing with fraudulent transactions. The word, however, carries its own meaning on the face of it, and there is practically no difference between fraud in the popular and fraud in the legal sense. Any course of conduct that would generally be described as dishonest, any cheating or deceiving another so that he would be injured thereby, would be fraud in law as in common parlance.

The essential element in fraud is misrepresentation—producing a false impression on the mind of another—causing him to believe that which is not true. And misrepresentation, to amount to fraud, must also be intentional.

It is in reference to contracts that the legal treatment of fraud is of the greatest importance. The broad rule is, that any contract tainted by fraud is void, at the option of the party injured. Innocent misrepresentation, in the sense above defined, has no such effect on a contract—has, in general, no effect at all, unless in certain exceptional cases. Thus, if the representation is a *condition*, the contract is avoided if it turn out not to be true. Or, if it is a *warranty*, its falsehood will give a right of action for the breach thereof. And so in certain other cases. But willful misrepresentation or fraud taints the whole contract.

FRAUENBURG, a town of Prussia, province of East Prussia, government district of Königsberg, is sit-

rated on the Frische Haff, and at the mouth of the Baude, forty-one miles southwest of Königsberg.

FRAUENFELD, a town of Switzerland, capital of the canton of Thurgau (or Thurgovia), is situated in a beautiful and fertile district on the Murg, twenty-three miles northeast of Zurich. It is the artillery depot for east Switzerland, and possesses an old castle with a tower belonging to the tenth century, an old Capuchin monastery, a town-house, an armory, and a canton school. Population about 6,000.

FRAUENLOB, the name by which a German poet of the thirteenth century is almost exclusively known, though his real name was Heinrich von Meissen. Frauenlob was born in 1260 of a humble burgher family. He died in 1318, and was buried in the cloisters of the cathedral at Mainz. His grave is still marked by a copy made in 1783, of the original tombstone of 1318; and in 1842 a monument by Schwanthaler was erected by the ladies of the city in another part of the cloisters.

FRAUNHOFER, JOSEPH VON, a celebrated optician, was born at Straubing in Bavaria, March 6, 1787. His father, a poor glazier, having died in 1798, young Fraunhofer in August of the following year was apprenticed to Weichselberger, a glass-polisher and looking-glass maker. Having by day no time that he could call his own, he studied the few old books that he possessed during leisure snatched from sleep. On July 21, 1801, he nearly lost his life by the fall of a house in which he lodged, and the elector of Bavaria, Maximilian Joseph, who was present at his extrication from the ruins, gave him eighteen ducats. With a portion of this sum he obtained release from the last six months of his apprenticeship, and with the rest he purchased a glass-polishing machine. He now employed himself in making optical glasses, and in engraving on metal, devoting his spare time to the perusal of works on mathematics and optics. In 1806 he obtained the place of optician in the mathematical institute which in 1804 had been founded at Munich by Joseph von Utzschneider, G. Reichenbach, and J. Liebherr; and in 1807 arrangements were made by Utzschneider for his instruction by Pierre Louis Guinand, a skilled optician, in the fabrication of flint and crown glass, in which he soon became an adept. With Reichenbach and Utzschneider, Fraunhofer established in 1809 an optical institute at Benedictbeuern, near Munich, of which he in 1818 became sole manager. The institute was in 1819 removed to Munich, and on Fraunhofer's death came under the direction of G. Merz. Among the earliest mechanical contrivances of Fraunhofer was a machine for polishing mathematically uniform spherical surfaces. He was the inventor of the stage-micrometer, and of a form of heliometer; and in 1816 he succeeded in constructing for the microscope achromatic glasses of long focus, consisting of a single lens, the constituent glasses of which were in juxtaposition, but not cemented together. The great reflecting telescope at Dorpat was manufactured by Fraunhofer, and so great was the skill he attained in the making of lenses for achromatic telescopes that, in a letter to Sir David Brewster, he expressed his willingness to furnish an achromatic glass of eighteen inches' diameter. For his researches published in the *Denkschriften der Münchener Akademie* for 1814-15, by which he laid the foundation of solar and stellar chemistry, Fraunhofer is especially known. The dark lines of the spectrum of sunlight, earliest noted by Doctor Wollaston were independently discovered, and, by means of the telescope of a theodolite, between which and a distant slit admitting the light a prism was interposed, were for the first time carefully observed by Fraunhofer, and have on that account been designated "Fraunhofer's lines."

He constructed a map of as many as 576 of these lines, the principal of which he denoted by the letters of the alphabet from A to G; and by ascertaining their refractive indices he determined that their relative positions are constant, whether in spectra produced by the direct rays of the sun, or by the reflected light of the moon and planets. The spectra of the stars he obtained by using, outside the object-glass of his telescope, a large prism, through which the light passed to be brought to a focus in front of the eye-piece. He showed that in the spectra of the fixed stars many of the dark lines were different from those of the solar spectrum, while other well-known solar lines were wanting; and he hence concluded that it was not by any action of the terrestrial atmosphere upon the light passing through it that the lines were produced. In 1823 he was appointed conservator of the Physical Cabinet at Munich, and in the following year he received from the king of Bavaria the civil order of merit. He died at Munich, June 7, 1826.

FRAUSTADT, a garrison town, and the chief town of a circle in the government district of Posen, Prussia, is situated in a flat, sandy country fifty miles south-southwest of Posen. Population about 8,000.

FRAYSSINOU, DENIS ANTOINE LUC, COMTE DE, a Gallican prelate and Bourbonist minister, distinguished as an orator and as a controversial writer, was born of humble parentage at Curières, in the department of Aveyron. He died at St. Géniez, December 12, 1741.

FREDERICIA, or **FRIDERICIA**, a fortified town of Denmark, near the southeast corner of Jutland, on the shores of the Little Belt. Population, 8,000.

FREDERICK, the county-seat of Frederick county, Maryland, is situated forty-four miles northwest of Washington, D. C., and sixty miles west by north of Baltimore, at the intersection of several railroads. The city is well built, with wide streets and some fine public buildings, including a city hall, county courthouse, and the State Deaf and Dumb Institute. The manufacturing industries include tanneries, foundries, sash factories, flouring mills, and manufactures of brick, wagons, and carriages. Two daily and three weekly newspapers are published here. There are five national and two savings banks. Population in 1900, 9,296.

FREDERICK, in German **FRIEDRICH**, the name, signifying Rich in Peace, borne by a considerable number of European (principally German) sovereigns. The most important of these, including the compound names Frederick Augustus and Frederick William, are noticed here in the following order: the emperors, the electors of Brandenburg and kings of Prussia, the electors and kings of Saxony, and the electors palatine.

FREDERICK I., surnamed by the Italians Barbarossa, Holy Roman emperor, and one of the greatest of German sovereigns, was the son of Frederick the One-eyed of Hohenstaufen, duke of Swabia, and of Judith, daughter of Henry the Black, duke of Bavaria, and was born most probably in 1123. He succeeded his father as duke of Swabia in 1147, and in the same year accompanied his uncle Conrad III. on his disastrous crusade. As in addition to his exceptional personal qualities Frederick possessed the advantage of uniting in himself the blood of the two great rival families, the Guelphine and the Ghibelline, Conrad III., though possessing an infant son, nominated him as his successor. On the death of Conrad this choice was unanimously ratified by the assembly at Frankfurt, March 4 or 5, 1152, and on the 9th of the same month Frederick received the crown of Germany at Aix-la-Chapelle.

The major part of his long reign was spent in wars, principally with Italian principalities and other neigh-

boring powers, the outcome of most of which struggles was the augmentation of his dominions by vast additions of territory and population. His attitude toward the popes was also another factor of disquiet, as he was almost constantly embroiled in the support of one or the other faction, which disputed supremacy of the papal see. His success was signalized by the attainment of the crown of Italy, in 1186, for his oldest son Henry, after having failed in five attempts to obtain possession of that country.

Having thus at last brought his long life-struggle to an honorable if not very triumphant close, it might have been expected that Frederick would now have been content to doff his armor, and to pass his remaining days in peace. But hearing in 1187 of the victorious progress of Saladin against the Christians in Syria, his martial ardor was again kindled, and he resolved to enter the lists against the redoubtable Saracen conqueror. This purpose he was, however, unable to carry fully out, for after two successful battles in Asia Minor, he was drowned before reaching Syria while crossing a small river in Pisidia, June 10, 1190.

Frederick I. is said to have taken Charlemagne as his model; but the contest in which he engaged was entirely different both in character and results from that in which his great predecessor achieved such a wonderful temporary success. Though Frederick failed to subdue the Italian republics, the failure can scarcely be said to reflect either on his prudence as a statesman or his skill as a general, for his ascendancy was finally overthrown rather by the ravages of pestilence than by the might of human arms. In Germany his resolute will and sagacious administration subdued or disarmed all discontent, and he not only succeeded in welding the various rival interests into a unity of devotion to himself against which papal intrigues were comparatively powerless, but won for the empire a prestige such as it had not possessed since the time of Otto the Great. The wide contrast between his German and Italian rule is strikingly exemplified in the fact that, while he endeavored to overthrow the republics in Italy, he held in check the power of the nobles in Germany, by conferring municipal franchises and independent rights on the principal cities. Even in Italy, though his general course of action was warped by wrong prepossessions, he in many instances manifested exceptional practical sagacity in dealing with immediate difficulties and emergencies. Possessing great physical beauty, frank and open manners, untiring and unresting energy, and a prowess which found its native element in difficulty and danger, he seemed the embodiment of the chivalrous and warlike spirit of his age, and was the model of all the qualities which then won highest admiration. Stern and ambitious he certainly was, but his aims can scarcely be said to have exceeded his prerogatives as emperor; and though he had sometimes recourse when in straits to expedients almost diabolically ingenious in their cruelty, yet his general conduct was marked by a clemency which in that age was exceptional. His quarrel with the papacy was an inherited conflict, not reflecting at all on his religious faith, but the inevitable consequence of inconsistent theories of government, which had been created and could be dissipated only by a long series of events.

FREDERICK II., Holy Roman Emperor, surnamed the Hohenstaufen, the most remarkable historic figure of the Middle Ages, grandson of the preceding, and son of Henry VI. and of Constance, heiress of the throne of Sicily, was born at Jesi, near Ancona, December 26, 1194. He was elected king of the Romans in 1196; and, his father having died September 28, 1197, he was in May, 1198, crowned king of Sicily. At a

diet held at Nuremberg, in October 1211, it was resolved to offer the crown of Germany to the young king of Sicily, who in July, 1215, ascended the marble throne of Charlemagne at Aix-la-Chapelle, and received the silver crown. At a solemn ceremony which followed he took the cross; but even after the death of Otto, in May, 1218, he was fully occupied in establishing his influence in Germany. In 1220 he succeeded in obtaining the election of his son Henry to the German throne.

The departure of the crusade, at first fixed for 1223, was deferred till 1225, and even then it was found necessary to delay it for two years longer; but, his wife Constance having died in 1222, he gave a pledge that his ambition coincided with the papal wishes by marrying in 1225 Yolande, daughter of King John of Jerusalem; and he also bound himself by heavy penalties to set out with a stipulated force in August, 1227. Frederick actually set out at the time agreed upon, but returned three days afterward, and, asserting as his reason a serious illness, permitted the armament to be dissolved, whereupon Gregory without further negotiation launched against him, September 30th, the solemn bull of excommunication. In resolving to set out on the crusade, notwithstanding his excommunication, Frederick was actuated, not merely by the wish to take possession of a secular throne, or to demonstrate the sincerity of his purpose to keep his oath, but by the determination to assert his right still to act as the temporal head of the church. His preparations were not delayed by the death of his wife Yolande in April, 1228, and he set sail from Otranto on June 20th. Meanwhile, by securing the favor of the Frangipani and the other Roman patricians, he procured the expulsion of Gregory from Rome; but the subtle spiritual influence of the papal ban was not affected by this seeming victory, and tidings of his excommunication reaching the Holy Land almost simultaneously with his arrival, the Knights of the Temple and the Hospital refused to take part in the crusade. Frederick, however, by mere diplomatic tact, succeeded in persuading the sultan of Egypt to agree to a treaty, by which the church obtained possession of Jerusalem and the holy places on granting to the Saracens, besides various other privileges, free access to Bethlehem; and on March 18, 1229, he, without any religious ceremony, crowned himself with his own hands king of Jerusalem. Such a striking and unexpected success wrought almost immediately throughout Europe a complete revolution of opinion in his favor; and when shortly afterward he succeeded in defeating the papal forces which had invaded his dominions, the pope deemed it expedient to come to terms, and released him from the ban of excommunication in 1230.

In the interval of peace which followed, Frederick occupied himself in forming for his Sicilian kingdom a code of laws, the main features of which were the superseding of irresponsible feudal and ecclesiastical jurisdictions by a uniform civil legislation administered under direct imperial control; the toleration extended to Jews and Mahometans, and the severe enactments against schismatics; the provisions for the emancipation of the peasants; the regulations for the encouragement of commerce, which contain perhaps the first enunciation of the modern doctrine of free trade; and the establishment of annual parliaments, consisting of barons, prelates, and representatives from the towns and cities. He also devoted much of his attention to the advancement of learning and of the arts and sciences. The university of Naples, founded in 1224, but whose operations had been for some time suspended, he now restored and liberally endowed; at the medical schools of Salerno he provided Arab, Latin, Greek, and Hebrew

teachers for the students of these different nationalities; and he caused the translation into Latin of the works of Aristotle and of other philosophers both Greek and Arabic.

The short period of peaceful progress was broken in 1234 by the rebellion of Frederick's son Henry, who, secretly instigated by the pope, joined the Lombard league. The revolt was, however, suppressed on the arrival of the emperor in Germany in 1235, and Henry was sent as a prisoner to the castle of San Felice in Apulia. In the same year Frederick married Isabella, sister of Henry III. of England. Conrad, second son of the emperor, was chosen king by the German princes in January, 1237; and Frederick, after the disastrous defeat of the Lombards at Cortenuova, November 27th of this year, appointed, in October, 1238, his natural son Enzo, king of Sardinia. Alarmed at the success of the imperial arms, Gregory, in March, 1239, renewed against the emperor the ban of excommunication; but the latter advancing into the states of the church, captured Ravenna, Faenza, and Benevento; and after gaining, through the help of Enzo, a brilliant victory over the Genoese fleet, was nearing Rome when Gregory died August 21, 1241. After the short pontificate of Celestine IV. and an interregnum of eighteen months, Cardinal Sinibald Fiesco, up to this time one of the emperor's chief friends, became pope as Innocent IV. in June, 1243. At once negotiations were entered into for an arrangement between them; but the papal demands were too humiliating to permit of their acceptance; and Innocent, suddenly making his escape to Lyons, not only renewed, July 17, 1245, the church's ban against the emperor, but declared his throne vacant. Henry Raspe of Thuringia, elected by the papal party king of the Romans in May, 1246, gained a victory over Conrad at Frankfort on August 5th, but, suffering a total defeat near Ulm, February 17, 1247, died shortly afterward; and between his successor William of Holland and Conrad the struggle was carried on with indecisive results. In this same year Peter de Vine, the minister and most intimate friend of Frederick, was discovered plotting against his life; on February 18, 1248, Frederick's army in Italy was surprised and utterly routed by a sally of the citizens of Parma; in May, 1249, his son Enzo was defeated and captured by the Bolognese; and, although in 1250 various successes in the north of Italy and the prospect of new and powerful alliances seemed to promise him a speedy and complete triumph, his strength had been so worn out by his arduous struggle, and his spirit so broken by such a succession of disasters that he died somewhat suddenly on December 13th, at his hunting lodge of Fiorentino (also called Firenzuola), near Lucera.

FREDERICK III. (1286-1330), surnamed the Fair, son of King Albert I. of Germany, duke of Austria, and rival for the German crown with Louis IV. the Bavarian. (See Louis IV.)

FREDERICK IV. German king, as emperor Frederick III., son of Duke Ernest of Styria, was born at Innsbruck, September 21, 1415. Along with his brother Albert the Prodigal he assumed, in 1435, the government of Styria, Carinthia, and Carniola, and, having been elected in 1440 to succeed Albert II. as king of Germany, he was crowned at Aix-la-Chapelle in 1442. He was crowned emperor in 1452. Frederick died in 1493.

FREDERICK WILLIAM, elector of Brandenburg, was born in Berlin in 1620. He is usually called "The Great Elector," and, next to Frederick the Great, he was the chief founder of the power of Prussia. When, at the age of twenty (1640), he succeeded to the electorate, he found it almost ruined. It was universally ad-

mitted that he was the true heir of the dukes of Pomerania, whose line died out in 1637; but at the Peace of Westphalia the lion's share of their territory was ceded to Sweden, Frederick William receiving only the eastern half of the country, shorn of Stettin. But he also obtained the bishoprics of Halberstadt, Minden, and Camin, with a promise of the archbishopric of Magdeburg. In 1655 war broke out between Sweden and Poland. Charles Gustavus, king of Sweden, compelled Frederick William to join him, and to do homage for Prussia, which had formerly been held in fief of Poland. After a battle of three days at Warsaw, the Poles were defeated (1656). In the following year the elector concluded an alliance with the Poles, receiving, by the treaty of Wehlau, in return for the promise of his aid, an acknowledgment of the complete independence of Prussia. In 1666 he received, by the settlement of the Jülich-Cleve dispute, the duchy of Cleve proper, and the counties of Mark and Ravenstein; while Jülich and Berg were to fall to Brandenburg in the event of the Pfalz-Neuburg line dying out.

In 1674 he drove the Swedes not only from Brandenburg but from Pomerania, of which he became complete master. Between three and four years afterward (about Christmas, 1678) they invaded Prussia, threatening Königsberg. In the dead of winter Frederick started from Berlin with a powerful force, and in the middle of January, 1679, finally beat them, crossing the Frische Haff with 4,000 men on sledges. After all, however, he did not obtain Pomerania, for when the peace of St. Germain-en-Laye was concluded in 1679, Louis XIV. insisted on its being restored to his ally, the king of Sweden. Frederick William, indignant at Austria for allowing this, maintained for a time an alliance with France; but he had ultimately to cultivate the friendship of the emperor, from whom he hoped to obtain the Silesian principalities of Liegnitz, Brieg and Wohlau, which, after 1675, he claimed as his by inheritance. He received the circle of Schwiebus, in Silesia (1686), on condition that he should withdraw his claim and send 8,000 men to the help of the emperor in his war with the Turks. Two years afterward he died.

FREDERICK I., the first king of Prussia, was born at Königsberg, 1657. He was the son of the Great Elector by his first marriage. In consequence of a fall from the arms of his nurse his spine was so seriously injured that he was deformed for life. In the course of his reign he exercised considerable influence on European politics by placing auxiliary forces at the disposal of friendly princes. For years he endeavored to induce the emperor Leopold I. to recognize him as king of Prussia. At last, in November, 1700, the emperor consented, insisting, however, on various strict conditions, one of which was that in the approaching war of the Spanish succession Prussia should contribute a force of 10,000 men to the Austrian army. Immediately after receiving the imperial sanction, Frederick started with his whole court for Königsberg, where, on January 18, 1701, with much ceremony, he crowned himself. He sent 20,000 men into the war of the Spanish succession, and a portion of them did excellent service at the battle of Blenheim. Frederick died on February 25, 1713.

FREDERICK WILLIAM I., king of Prussia, son of Frederick I., by his second marriage, was born in 1688. He was soon imbued with a passion for military life, and this was deepened by acquaintance with the duke of Marlborough and Prince Eugene, whom he visited during the siege of Tournay. In 1715 he was forced, in alliance with Russia, Saxony and Denmark, into a war with Charles XII. of Sweden, in consequence of which, in return for two million thalers paid to Sweden, he obtained the islands of Wollin and Usedom

Stettin, and part of Swedish Pomerania. This was his only war. He despised many things which the modern world holds in high esteem, and was often coarse, violent, and fond of hide us practical jokes. Nevertheless, Prussia profited immensely by his reign. He saw the necessity of rigid economy, not only in his private life, but in the whole administration of the state; and the consequence was that he paid off the debts incurred by his father, and left to his successor an overflowing treasury. He did nothing for the higher learning, and even banished the philosopher Wolf at forty-eight hours' notice, "on pain of the halter," for teaching, as he believed, fatalist doctrines; but he established many village schools, and he encouraged industry by every means in his power, particularly agriculture. Under him the nation flourished, and, although it stood in awe of his vehement spirit, it respected him for his firmness, his honesty of purpose, and his love of justice. He was devoted to his army, the number of which he raised from 48,000 to 83,500; and there was not in existence a more thoroughly drilled or better appointed force. He died May 31, 1740, leaving behind him his widow, Sophie Dorothea of Hanover, and a numerous family.

FREDERICK II., king of Prussia, born on January 24, 1712, was the son of Frederick William I., and is usually known as Frederick the Great. He was brought up with extreme rigor, his father devising a scheme of education which was intended to make him a hardy soldier, and prescribing for him every detail of his conduct. As he grew up he became extremely dissatisfied with the dull and monotonous life he was compelled to lead; and his discontent was heartily shared by his sister, Wilhelmina, a bright and intelligent young princess for whom Frederick had a warm affection. Frederick William, seeing the divergence of his son's tastes from his own, gradually conceived for him an intense dislike, which often found expression in violent outbursts of anger. So harsh was his treatment that Frederick frequently thought of running away and taking refuge at the court of his uncle, George II. of England; and he at last resolved to do so during a journey which he made with the king to South Germany in 1730, when he was eighteen years of age. He was helped by his two friends, Lieutenant Katte and Lieutenant Keith; but by the imprudence of the former the secret was found out. Frederick was placed under arrest, and the king abused him so cruelly on board a yacht at Frankfurt that some courtiers had to interfere, and to separate them. Warned by Frederick, Keith escaped; but Katte delayed his flight too long, and a court martial decided that he should be punished with two years' fortress arrest. The king changed this sentence into one of death, and the young soldier was executed outside the fortress of Cüstrin, in which Frederick was kept a close prisoner. The same court martial which had judged him decided that, as a lieutenant-colonel attempting to desert, the crown prince had incurred the legal penalty of death. For some time the king actually thought of giving effect to the sentence; and he at last relented only in consequence of grave expostulations from the emperor and the kings of Sweden and Poland.

For about fifteen months Frederick now lived in the town of Cüstrin, having an establishment of his own, but serving as the youngest councilor at the government board there. He took great care not to offend his father, and was partially restored to favor. In 1732 he was made colonel commandant of a regiment in Ruppin, and in the following year he married, in obedience to the king's orders, the Princess Elizabeth Christina, daughter of the duke of Brunswick-Bevern. The palace of Rheinsberg in the neighborhood of Ruppin was

built for him, and there he lived until he succeeded to the throne.

In 1740 he became king. He maintained all the forms of government established by his father, but ruled in a far more liberal and enlightened spirit. On the year of his accession, the emperor Charles VI. died. Frederick at once began to make extensive military preparations, and it was soon clear to all the world that he intended to enter upon some serious enterprise. He had made up his mind to take possession of Silesia.

Frederick sent an ambassador to Vienna, offering, in the event of his rights in Silesia being conceded, to aid Maria Theresa against her enemies. The queen of Hungary, who regarded the proposal as that of a mere robber, haughtily declined; whereupon Frederick immediately invaded Silesia with an army of 30,000 men. His first victory was gained at Mollwitz on April 10, 1741. A second Prussian victory was gained at Chotusitz, near Czeslau, on May 17, 1742, by which time Frederick was master of all the fortified places of Silesia. Maria Theresa, in the heat of her struggle with France and the elector of Bavaria, now Charles VII., and pressed by England to rid herself of Frederick, concluded with him, on June 11, 1742, the peace of Breslau, conceding to Prussia Upper and Lower Silesia as far as the Oppa, together with the county of Glatz. Frederick made good use of the next two years, fortifying his new territory, and repairing the evils inflicted upon it by the war. By the death of the prince of East Friesland without heirs, he also gained possession of that country. He knew well that Maria Theresa would not, if she could help it, allow him to remain in Silesia; accordingly, in 1744, alarmed by her victories, he arrived at a secret understanding with France, and pledged himself, with Hesse-Cassel and the palatinate, to maintain the imperial rights of Charles VII., and to defend his hereditary Bavarian lands. Frederick began the second Silesian war by entering Bohemia in August, 1744, and taking Prague. By this brilliant but rash venture he put himself in great danger, and soon had to retreat; but in 1745 he gained the battles of Hohenfriedberg, Sorr, and Hennesdorf; and Leopold of Dessau ("Der alte Dessauer") won for him the victory of Kesselsdorf in Saxony. The latter victory was decisive, and the peace of Dresden (December 25, 1745) assured to Frederick a second time the possession of Silesia.

Frederick had thus, at the age of thirty-three, raised himself to a great position in Europe, and henceforth he was the most conspicuous sovereign of his time.

Maria Theresa had never given up hope that she would recover Silesia; and as all the neighboring sovereigns were bitterly jealous of Frederick, and somewhat afraid of him, she had no difficulty in inducing several of them to form a scheme for his ruin. Russia and Saxony entered into it heartily; and France, laying aside her ancient enmity toward Austria, joined the empress against the common object of dislike. Frederick, meanwhile, had turned toward England, which saw in him a possible ally of great importance against the French. A convention between Prussia and Great Britain was signed in January, 1756, and it proved of incalculable value to both countries, leading, as it did, to a close alliance during the administration of Pitt. Through the treachery of a clerk in the Saxon foreign office, Frederick was made aware of the future which was being prepared for him. Seeing the importance of taking the initiative, and, if possible, of securing Saxony, he suddenly, on August 24, 1756, crossed the frontier of that country, and shut in the Saxon army between Pirna and Königstein, ultimately compelling it, after a victory gained over the Austrians at ~~Lowitz~~ ^{Lützen}, to surrender. Thus began the Seven Years' War, in

which, supported by England, Brunswick, and Hesse-Cassel, he had for a long time to oppose Austria, France, Russia, Saxony, and Sweden.

In 1757, after defeating the Austrians at Prague, he was himself defeated by them at Kolin; and by the shameful convention of Closter-Seven, he was freely exposed to the attack of the French. In November, 1757, however, when Europe looked upon him as ruined, he rid himself of the French by his splendid victory over them at Rossbach, and in about a month afterward, by the still more splendid victory at Leuthen, he drove the Austrians from Silesia. From this time the French were kept well employed in the west by Prince Ferdinand of Brunswick, who defeated them at Crefeld in 1758, and at Minden, in 1759. In the former year Frederick triumphed, at a heavy cost, over the Russians at Zorndorf; and although, through lack of his usual foresight, he lost the battle of Hochkirchen, he prevented the Austrians from deriving any real advantage from their triumph, Silesia still remaining in his hands at the end of the year. The battle of Kunersdorf, fought on August 12, 1759, was the most disastrous to him in the course of the war. He had here to contend both with the Russians and the Austrians; and although at first he had some success, his army was in the end completely broken. But he soon recovered from his despair, and in 1760 gained the important victories of Liegnitz and Torgau. He had now, however, to act on the defensive, and, fortunately for him, the Russians, on the death of the czarina Elizabeth, not only withdrew in 1762 from the compact against him, but for a time became his allies. On October 29th of that year he gained his last victory over the Austrians at Freiberg. Europe was by that time sick of war, every power being more or less exhausted. The result was that, on February 15, 1763, a few days after the conclusion of the peace of Paris, the treaty of Hubertusburg was signed, Austria confirming Prussia in the possession of Silesia.

Frederick's first care after the war was, as far as possible, to enable the country to recover from the terrific blows by which it had almost been destroyed; and he was never, either before or after, seen to better advantage than in the measures he adopted for this end. Although his resources had been so completely drained that he had been forced to melt the silver in his palaces and to debase the coinage, his energy soon brought back the national prosperity.

There was nothing about which Frederick took so much trouble as the proper administration of justice. Soon after he came to the throne Frederick began to make preparations for a new code. In the year 1749-51 his grand-chancellor, Von Cocceji, a man of wide knowledge and solid judgment, finished "The Project of the *Corporis Juris Fridericiani*," which was afterward made the basis of a legal system drawn up by the grand-chancellor Von Cramer—a system that came into operation in 1794 under Frederick's successor.

Looking ahead after the Seven Years' War, Frederick saw no means of securing himself so effectually as by cultivating the good will of Russia. In 1764 he accordingly concluded a treaty of alliance with the empress Catherine for eight years. Six years afterward, unfortunately for his fame, he joined in the first partition of Poland, by which he received Polish Prussia, without Dantzic and Thorn, and Great Poland as far as the Netzeffluss. Prussia was then for the first time made continuous with Brandenburg and Pomerania. Frederick would have run great risks had he refused to take part in this arrangement; but it was none the less a shameful violation of international law, the full penalty for which has perhaps not even yet been paid.

The emperor Joseph II., being of an ardent and impulsive nature, greatly admired Frederick, and visited him at Neisse, in Silesia, in 1769, a visit which Frederick returned, in Moravia, in the following year. The young emperor was frank and cordial; Frederick was more cautious, for he detected under the respectful manner of Joseph a keen ambition that might one day become dangerous to Prussia. Frederick never abandoned his jealousy of Austria, whose ambition he regarded as the chief danger against which Europe had to guard. He seems to have had no suspicion that evil days were coming in France. It was Austria which had given trouble in his time; and if her pride were curbed, he fancied that Prussia at least would be safe. Hence one of the last important acts of his life was to form, in 1785, a league of princes (the "Fürstenbund") for the defense of the imperial constitution, believed to be imperiled by Joseph's restless activity. The league came to an end after Frederick's death; but it is of considerable historical interest, as the first open attempt of Prussia to take the lead in Germany.

Frederick's chief trust was always in his treasury and his army. By continual economy he left in the former the immense sum of 70,000,000 thalers; the latter, at the time of his death, numbered 200,000 men, disciplined with all the strictness to which he had throughout life accustomed his troops. He died at Sanssouci August 17, 1786; his death being hastened by exposure to a storm of rain, stoically borne, during a military review. He passed away on the eve of tremendous events, which for a time obscured his fame; but now that he can be impartially estimated, he is seen to have been in many respects one of the greatest figures in modern history.

FREDERICK WILLIAM II., king of Prussia, was the nephew of Frederick the Great. His father, Augustus William, the second son of Frederick William I., having died in 1757, Frederick William was nominated by the king successor to the throne. The size and population of Prussia was largely increased under Frederick William II.; but, generally, he attained his aims by means which the more intelligent class of his subjects did not approve, and by his vacillating policy he greatly lowered the state in the esteem of the world. He not only exhausted the resources accumulated by Frederick the Great, but imposed on the country a burden of debt; and he excited much ill-feeling by introducing a severe censorship of the press, and by subjecting the clergy to laws conceived in a spirit of the narrowest orthodoxy. He died November 16, 1797. His first wife having been divorced in 1769, he married the Princess Louise of Hesse-Darmstadt, by whom he had five sons.

FREDERICK WILLIAM III., king of Prussia, was the eldest son of Frederick William II., and was born on August 3, 1770. In 1793 he married the Princess Louise, daughter of the duke of Mecklenburg-Strelitz. He was rather dull and slow; but he had a sincere desire for the welfare of his people; was capable in emergencies of undertaking a great enterprise, and allowed himself to be freely influenced by the loftier impulses of his wife. When he succeeded to the throne he at once removed the principal grievances due to the weakness of his father, and called to his aid capable and honest ministers. By the treaty of Lunéville, in 1801, he was obliged to concede to Napoleon his territory on the left bank of the Rhine; but he received some compensations. In 1805 he was brought for a short time into conflict with England for accepting Hanover from Napoleon in return for certain concessions. Up to this time he had remained at peace with France; but the formation of the Confederation of the Rhine in 1806

affed him with alarm and indignation, and, giving way to a sudden impulse, he demanded that all French troops should forthwith quit German soil. The result was the battles of Jena and Auerstädt, followed by those of Eylau and Friedland, and on July 9, 1807, he had to sign the treaty of Tilsit, which deprived him of half his kingdom. The king was forced in 1812 to conclude an alliance with Napoleon, and to aid him with an auxiliary corps in his expedition to Russia; but seeing the disastrous retreat of the French from Moscow, Frederick William appealed to the country to undertake a war of liberation. In due time the appeal was followed by the battle of Leipsic and the battle of Waterloo. After the conclusion of peace he labored sincerely, with the aid of competent ministers, to undo many of the evils caused by the confusion of the previous years; but he forgot that in his time of need he had promised to set up a constitutional system of government. He only instituted (1817) provincial estates; and after the July Revolution he proved himself an uncompromising and bitter opponent of liberal ideas. He died on June 7, 1840.

FREDERICK WILLIAM IV., king of Prussia, the son of Frederick William III., was born on October 15, 1795. He married Princess Elizabeth of Bavaria in 1823, but had no children. In 1847 he assembled at Berlin a united diet, made up of representatives of the provincial diets established by his father, and created intense discontent by proclaiming that he would not allow a constitution to stand between him and his people. The revolutionary movement of 1848, took him wholly by surprise, and he was so alarmed that he not only promised to institute parliamentary government, but placed himself at the head of the agitation for the unity of Germany. When, however, in 1849 the national assembly at Frankfort offered him the title of emperor, he declined it. He formed an alliance with Hanover and Saxony for the purpose of creating a new German constitution, and summoned a national parliament at Erfurt. Austria insisted on the old Frankfort diet being reestablished, and for a time war appeared to be imminent. Ultimately, by the treaty of Olmütz (1850) Austria prevailed. In 1850 the Prussian constitution was proclaimed, but it was interpreted in a narrow sense, and under the reactionary ministry of Manteuffel some of its most essential provisions were soon changed. On his way back from Vienna in the summer of 1857, he had a stroke of paralysis in Dresden; in October of the same year he had a second stroke in Berlin. From this time, with the exception of brief intervals, his mind was clouded, and the duties of government were undertaken by his brother William, who on October 7, 1858, was formally recognized as regent. The king spent the winter of 1858-59 in Rome, where his health occasionally improved, but when he returned to Berlin in November, 1860, his end was seen to be near, and he died at Sanssouci on the night of January 2, 1861.

FREDERICK I., elector and duke of Saxony, surnamed the Pugnacious, eldest son of Landgraf Frederick the Severe of Thuringia and of Catherine countess of Henneberg, was born at Altenburg, March 29, 1369. He died at Altenburg, January 4, 1428. The university of Leipsic was founded by Frederick in 1409.

FREDERICK II., elector and duke of Saxony, surnamed the Meek, son of the former and of Catherine of Brunswick, succeeded his father in 1428.

FREDERICK III., elector and duke of Saxony, surnamed the Wise, grandson of the preceding and son of Duke Ernst, was born at Torgau 1463. On the death of his father in 1486, he succeeded him in the sole government of Saxony, but divided the other possessions of

the Ernestine line with his brother John the Constant. Frederick founded the university of Wittenberg in 1502 and appointed Melancthon and Luther to two of its chairs. He was three times imperial vicar, and on the death of Maximilian I. he was offered the imperial throne, but declined it, and, in accordance with his recommendation, it was bestowed on Charles V. Frederick died at Lochau May 5, 1525.

FREDERICK III., King of Prussia (Frederick I. of Germany), formerly known as "Unser Fritz," the Crown Prince of Prussia, was the son of Emperor William I. of Germany, and was born at Potsdam, October 13, 1831. He was an interested witness of the scenes of the revolution of 1848, and it is more than probable that to the influence exerted by these scenes was due his liberal spirit in after years. In 1861 his father ascended the throne of Prussia as William I., and he was at that time a general in the army—having all through his life been the subject of thorough military training. He had previously married (in 1857) Princess Victoria Adelaide, the eldest daughter of Queen Victoria of England. The issue of this marriage were seven children, the eldest being the present Emperor William III., who was born in 1859. Frederick took part in the war of 1866 between Denmark and the coalition of Prussia and Austria, and also commanded one of the armies of invasion in the subsequent war between Austria and Prussia, and took a leading part in the decisive battle of Sadowa. During the Franco-Prussian war of 1870 he commanded the army corps which invaded France through the territories of Alsace and Lorraine, and for his distinguished services he was made field marshal-general, the highest military dignity known to the Prussian service. After the war was over he returned to Berlin and was engaged in civil duties, assisting his father in the administration of the affairs of the empire (of which he had become, by the crowning of his father as emperor, the prince imperial), and at this period of his life spent considerable time in foreign travel. He was not in sympathy with the extreme policy of Bismarck, but their amicable relations suffered no serious interruption. In his domestic relation he was plain, unostentatious; a good husband and a kind father; and although his entire life had been spent in the midst of soldiery and military surroundings, he was disinclined to war, and an ardent advocate of peace. He was universally beloved for his sterling qualities, and during his last illness was the object of more sympathy and tender solicitude than had ever before been the lot of any sovereign to receive. In March, 1888, on the death of his father, the emperor William I., he ascended the imperial throne, and his brief reign of three months has a melancholy interest, on account of his sufferings, borne with such heroic fortitude. He was never formally crowned, on account of his physical inability to undergo the fatigue incident to the ceremony, and he died at Berlin June 15, 1888, surrounded by his family and the officials of his household. [For the incidents of his reign, and an account of his death, see the article GERMANY.]

FREDERICK AUGUSTUS I., elector of Saxony. See AUGUSTUS II., of Poland.

FREDERICK AUGUSTUS II., elector of Saxony. See AUGUSTUS III., of Poland.

FREDERICK AUGUSTUS I., king of Saxony, son of Elector Frederick Christian, was born at Dresden, December 23, 1750, succeeded his father, under the guardianship of Prince Xavier, in 1763, and was declared of age in 1768. In the following year he married Princess Maria-Amelia of Deux-Ponts. In 1791 he declined the crown of Poland. He refused to join the league against France in 1792 but when war was de-

clared his duty to the German empire necessitated his taking part in it. He maintained his neutrality during the war between France and Austria in 1805, but in the following year he joined Prussia against France. After the disastrous battle of Jena he concluded a treaty of peace with Napoleon at Posen, November 11, 1806, and, assuming the title of king, he joined the Rhenish confederation. Having taken part in the subsequent wars of Napoleon, he fell into the hands of the allies after the entry into Leipsic, October 19, 1813; and although he regained his freedom after the congress of Vienna, he was compelled to give the province of Wittenberg to Prussia. His reign throughout was characterized by justice, probity, moderation, and prudence. He died May 5, 1827.

FREDERICK AUGUSTUS II., king of Saxony, eldest son of Prince Maximilian and of Caroline-Maria Theresa of Parma, was born May 18, 1797. His death occurred accidentally through the upsetting of his carriage between Imst and Wenns, in Tyrol, August 9, 1854. Frederick devoted his leisure hours chiefly to the study of botany.

FREDERICK I., elector palatine, surnamed the Victorious, second son of Elector Louis III., was born in 1425, and died in 1476.

FREDERICK II., elector palatine, surnamed the Wise, fourth son of Philip the Noble-minded, was born in 1482, and died in 1556.

FREDERICK III., elector palatine, surnamed the Pious, eldest son of John II., palatine of Simmern, was born in 1515, succeeded his father in 1556, and became elector palatine on the death of Otto Henry in 1559. He died October 26, 1576.

FREDERICK IV., elector palatine, surnamed the Upright, son of Elector Louis VI. and of Elizabeth of Hesse, was born in 1574, and succeeded his father under the guardianship of his uncle John Casimir in 1583, and after the death of the latter in 1592 ruled as independent governor. His reign is chiefly of importance for the steadfast and firm support he rendered to the Protestant cause. Under his auspices the Protestant union of Germany was formed in 1601. He died in 1610.

FREDERICK V., elector palatine and king of Bohemia, son of Frederick IV. and of Louisa Julia, daughter of William of Orange, was born at Amberg in 1596, and succeeded his father in 1610. Frederick died at Mainz, November 19, 1632.

FREDERICKSBURG, a city of Spotsylvania county, Virginia, on the southwest side of the Rappahannock river, one hundred and ten miles above its mouth in Chesapeake Bay, and sixty-one miles north of Richmond. The river, which is tidal up to this point, is here closed by a dam 900 feet long. It supplies motive-power for flour and other mills, and affords facilities for transportation of grain, marble and freestone. Near the city is an unfinished monument, began in 1833, over the grave of the mother of Washington. Population (1900), 5,068.

FREDERICKSBURG, BATTLE OF. After the battle of Antietam, the sentiment of opposition in the North to General McClellan, who had failed to follow up the advantages (barren though they were) resulting from that battle, culminated in his dismissal, and, shortly subsequent, supersession by Gen. A. E. Burnside, as commander of the army of the Potomac. Although General Burnside had announced his incapability for the command of so large an army, he was forced to accept, and December, 1862, found him encamped on the north bank of the Rappahannock river, with his headquarters at the Lacy house in Stafford county.

Lee's army lay on the south bank some distance from the town of Fredericksburg, but on the first intimation that Burnside was about to attempt to cross the river he promptly advanced to the town and massed his army on the hills which surround the town in a crescent shape—the convexity, pointing to the town, being occupied by the center of Lee's army, while the left, which receded to the southwest, was held by Longstreet, Jackson holding the right, with Stuart on his extreme right guarding Hamilton's crossing—a point on the range surrounding the town, which could only be approached from the river by crossing the R. F. and P. railroad and the narrow-gauge railroad cut—these two features of the surface of the country adding to the natural strength of the position of the Confederate army on the right. General Burnside determined to cross the river and assault Lee's army despite the fact that valuable time had been lost by him, and Lee had had time to render his position impregnable. His division commanders and subordinates generally, it is claimed, tried to dissuade him from making so rash an attempt, but all to no purpose. On November 7th he commenced his attempts to lay a pontoon at the west end of the town, over the river, at a point between the cotton mills, on the south bank of the river, and the Falmouth Heights, on the north. Sharpshooters in the town, however, prevented the accomplishment of this scheme, thus giving Lee additional time to perfect his arrangements, and it was not until a force had been sent across the river (at the suggestion of General Hunt), which cleared the town of Confederates, that the laying of the pontoons was successfully accomplished. In the meantime the town had been severely bombarded by the Federal batteries on Falmouth Heights, but all to no avail, so far as dislodging the Southern sharpshooters was concerned. Another bridge was simultaneously thrown over the river at Hamilton's crossing to the east of the town, and then the assaulting army—divided into three divisions under the command of Sumner, Hooker and Franklin, crossed the river and advanced on Lee's position. The crossing occupied two days, and, on December 13, 1862, under the cover of a dense cloud of fog and drizzle, the battle was begun.

The town of Fredericksburg lies, as has been before incidentally mentioned, at the foot of a low crescent-shaped ridge which rises from the rear or southern portion of the corporate limits with some abruptness, and then stretches out into a broad table-land, extending far to the south and west. On the extreme left of Lee's army lay the Rappahannock, while on the extreme right was Hazel "run"—a small creek or "branch," as it is called in the southern country. Immediately in front of Lee's center lay the town, between which two points was a canal full of water, and south of the canal was a roadway winding along the side of the hill, and along the side of this road ran a stone wall or fence, behind which was posted a strong body of Confederates. To the rear of this wall and on the top of the hill, at this point called Marye's Heights, was massed a heavy force of Confederate artillery.

Sumner and Hooker led their divisions over the pontoons on the Confederate left, while Franklin, on whom devolved the opening of the battle, crossed on the lower or eastern pontoon, and began the attack by assaulting Jackson, his men having to charge up the slope and across the railroad tracks, in the face of a murderous fire. They made a gallant fight, but flesh and blood could not stand the terrific storm they encountered. The artillery of the Southern army was so stationed that it could fire over the heads of its own infantry with terrible effect, while the Union army was almost entirely deprived of the use of its artillery.

the danger to their own men by its use being far greater than that to which the enemy was exposed from their fire. At the same time the Confederate infantry, being in a position almost impregnable, had no hard task to repel the assaults which were repeatedly made by the Union forces. Meade led the charge of Franklin's division, and although he put forth almost superhuman efforts, and received reinforcements, it was of no avail; nothing could be accomplished, and after having thousands of his men slaughtered, he withdrew from the fight, having accomplished nothing, and lost the flower of the Federal army. On the center the slaughter of the Union troops was terrible. Sumner's division deployed through and to the west of the town, and advanced against the position held by Pickett's men. In their course they had to charge over the canal and then up a long incline to the top of the hill. About half way up the hill they encountered the fire from the troops behind the wall mentioned before. Division after division was thrown against this point, and men were mown down like grass before the sickle. One brigade—the "Irish" brigade of Meagher—in particular suffered severely. These brave men were again and again ordered to charge and dislodge the Confederates behind the stone wall, the artillery in the meantime playing on them in one continuous fire. The task was hopeless, and after three-fourths of the troops so engaged had been killed, the order was given to desist. When the day was over it was found that the Federals had lost over 14,000 men, while the Confederate loss had been only about 5,000.

On the next day Burnside proposed to renew the assault, and it was only at the earnest solicitations of his subordinates that he desisted. Shortly after this battle he was, at the unanimous request of his generals of division, removed from command, and General Hooker was made his successor. Everything taken into consideration, this battle is one of the most remarkable fought during the entire course of the war. It has long been a bone of contention among the military authorities as to the circumstances which led Burnside to determine to give Lee battle under these conditions. He certainly could not have hoped to carry a position so strong as was that of the Confederate commander, and the whole affair is enshrouded with an air of mystery.

A second battle was fought at Fredericksburg a few months later during the CHANCELLORSVILLE CAMPAIGN (*q.v.*), General Early being attacked here by a Federal force under General Sedgwick, and forced to retire, but again occupying the same position after Sedgwick had gone on his way to effect a junction with Hooker at Chancellorsville.

Immediately after Burnside's defeat he recrossed the river, and after his removal the army, under Hooker, lay at Falmouth and in the adjoining country the remainder of the winter, no military operations of importance taking place until May, when Hooker attempted to turn Lee's flank, and fought the battle of Chancellorsville as is described under that head.

In 1864, during the Wilderness Campaign under General Grant, the town was repeatedly the scene of military operations. Indeed, it may be said that there is not a foot of the soil in and around the town, but has drunk the soldier's blood. In this vicinity the three greatest and bloodiest battles of the war were fought, and it is said that more than 100,000 men were killed in and around the town. There is now a large Federal cemetery on the top of Marye's Heights, upon the spot where the Confederate artillery was massed, while off to the left, at the foot of the slope, in a large grave-yard, sleep 15,000 Confederates, who fell here. There are other cemeteries close by, all filled with the remains of those who

fell in the battles in and around the town.

FREDERICKSHALD, or FREDERICKSHALL, a maritime town of Norway, stift of Christiania, at the junction of the Iddefjord with the Tistedals, fifty-seven miles south-southeast of Christiania.

FREDERICKSTAD, a fortified town of Norway, stift of Christiania, is situated at the mouth of the Glommen, forty-eight miles southeast of Christiania.

FREDERICTON, the capital of York county and of the Province of New Brunswick, is situated upon the right bank of the St. John's river, eighty-five miles from its mouth, and is a well built and thriving city, with a population (1901) of 7,117. Among the public buildings the chief are the new Parliament buildings, the county court-house, the provincial normal school, the legislative library building, and the government house, the residence of the lieutenant-governor. Fredericton has several railroads and ships large quantities of lumber by river. It has four banks, twelve churches, a convent, a university, a number of schools, and five newspapers. The city has a good water supply, and is lighted by gas and electricity. Of manufactures, the chief are foundries, carriage and sleigh factories, tanneries, and saw mills.

FREE CHURCH OF SCOTLAND, THE, is the name of a well known ecclesiastical organization which includes a considerable proportion of the inhabitants of Scotland. In one sense the Free Church dates its existence from the Disruption of 1843, in another it claims to be the rightful representative of the National Church of Scotland as it was reformed in 1560. There were three periods of reformation. The first reformation extended from 1560, when the church freely held her first General Assembly, and of her own authority acted on the *First Book of Discipline*, to 1592, when her Presbyterian order was finally and fully ratified by the parliament. The second period began in 1638, when, after twenty years of suspended animation, the assembly once more shook off Episcopacy, and terminated in 1649, when the parliament of Scotland confirmed the church in her liberties in a larger and ampler sense than before. The third period began in 1834, when the Assembly made use of what the church believed to be her rights in passing the Veto and Chapel Acts. It culminated in the Disruption of 1843.

The final struggle may be said to have begun with the passing in 1834 of the "Veto" Act, by which it was declared to be a fundamental law of the church that no pastor should be intruded on a congregation contrary to the will of the people, and by which it was provided that the simple dissent of a majority of heads of families in a parish should be enough to warrant a presbytery in rejecting a presentee. The question of the legality of this measure soon came to be tried in the civil courts; and it was ultimately answered in a sense unfavorable to the church by the decision (1838) of the Court of Session in the Auchterarder case, to the effect that a presbytery had no right to reject a presentee simply because the parishioners protested against his settlement, but was bound to disregard the veto. This decision elicited from the Assembly of that year a new declaration of the doctrine of the spiritual independence of the church. In the circumstances it was resolved by the Assembly of 1842 to transmit to the queen, by the hands of the lord high commissioner, a "claim, declaration and protest," complaining of the encroachments of the Court of Session, and also an address praying for the abolition of patronage. The home secretary's answer (received in January, 1843) gave no hope of redress. At the first session of the General Assembly in 1843 the entire

non-intrusion party withdrew to another place of meeting, where the first Assembly of the Free Church was constituted, with Dr. Thomas Chalmers as moderator. This Assembly sat from the 18th to the 30th of May, and transacted a large amount of important business. On Tuesday, the 23d, 396 ministers and professors publicly adhibited their names to the Act of Separation and Deed of Demission by which they renounced all claim to the benefices they had held in connection with the establishment, declaring them to be vacant, and consenting to their being dealt with as such. By this impressive proceeding, the signatories voluntarily surrendered an annual income amounting to fully £100,000.

The first care of the voluntarily disestablished church was to provide incomes for her clergy and places of worship for her people. Between November, 1842, and May, 1843, 647 associations had been formed; and at the first Assembly it was announced that upward of £17,000 had already been contributed. At the close of the first financial year (1843-44) it was reported that the fund had exceeded £61,000. It was participated in by 583 ministers; and 470 drew the full equal dividend of £105 (\$525). Each successive year showed a steady increase in the gross amount of the fund; but owing to an almost equally rapid increase of the number of new ministerial charges participating in its benefits, the stipend payable to each minister did not for many years reach the sum of £150 which had been aimed at as a minimum.

To provide for the erection of the buildings which, it was foreseen, would be necessary, a general building fund, in which all should share alike, was also organized, and local building funds were, as far as possible, established in each parish. At the end of four years considerably more than 700 churches had been provided.

During the winter session 1843-44 the divinity students who had joined the Free Church continued their studies under Doctor Chalmers and Doctor Welsh; and at the Assembly of 1844 arrangements were made for the erection of suitable buildings. The New College, Edinburgh, was built in 1847 at a cost of £46,506; and divinity halls have subsequently been set up also in Glasgow and Aberdeen.

FREEHOLD, in the English law of real property, is an estate in land, not being less than an estate for life. An estate for a term of years, no matter how long, was considered inferior in dignity to an estate for life, and unworthy of a freeman (see **ESTATE**).

FREE IMPERIAL CITIES is the ordinary English translation of *Freie Reichs-Städte*, a technical expression in German history. In Germany, as in other countries of Europe, a considerable number of towns succeeded, in the midst of the dynastic confusion of the Middle Ages, in maintaining or acquiring more or less complete independence of the state or sovereign within whose territory they were situated. This they effected partly by forming defensive leagues with each other, and partly by procuring, in return for service or money, privileges and protection from the successive occupants of the imperial throne. Of these free towns a certain proportion rose by commerce and industry to a position of great influence, and ultimately took rank along with kingdoms and principalities as integral members of the body politic of the empire. They first appear distinctly in this character in the reign of Henry VII. (1308-1313).

FREEMASONRY is the name given to that system of ritual and rules which Freemasons observe. It may also be applied to the masonic art, or the practice of masonic ritual and rule. The institution is not older than the beginning of the eighteenth century, but it has been lately said to include more than 10,000 lodges and

more than 1,000,000 members. The conception of Freemasonry implies cosmopolitan brotherhood, and was therefore impossible in the ancient world. If indeed the genuine legends of the craft were followed, its origin would be traced to the creation, the flood, or at least the building of Solomon's temple. Accordingly, one of the most popular and voluminous masonic writers of the nineteenth century, the Rev. George Oliver, informs the world that Moses was a grand master, Joshua his deputy, and Aholiah and Bezaleel grand wardens. The true historical precursors of the modern fraternity of Freemasons were the mediæval building corporations. Of these the most distinctive type is to be found in the stone masons of Germany. The *cammentarii* or *liberi muratores* at first grouped themselves round the monasteries, especially of the Benedictine order. The abbots were in many cases the architects who employed the masons on ecclesiastical buildings and repairs. As architecture developed, and with its increasing wealth the church gradually undertook larger and nobler works, these societies of craftsmen also assumed a more definite and more durable form. The taste and science of Gothic architecture were to a large extent the possession of the *Bauhütten*, or wooden booths where the stone-cutters during the progress of the work kept their tools, worked, held their meetings, and probably also took their meals and slept. In the twelfth century there are distinct traces of a general association of *Bauhütten* throughout Germany, acknowledging one set of craft laws, one set of secret signs and ceremonies, and to a certain extent one central authority in the *Haupthütte* of Strasburg. Albertus Magnus (1205-1280) is supposed to have introduced many of the Jewish and Arabian symbols which were popular in the craft. The privileges which a *Bauhütte* was able to give to its masters, *parlier* (speakers), and journeymen, were chiefly "a share in the administration of justice, in the election of officers, in the banquets, and in works of charity." The initiation is said to be copied from a Benedictine consecration. Instruction was given to all apprentices in both architecture and its allegory. When he had served his time and finished his "Wanderjahre," every man was entitled, if of good character, to receive the *Wortzeichen* or *der Gruss*. He took the oath of secrecy on the Bible, the compass, and the square, and drank the *Willkommen*. The three great lights, the hammer or gavel, the gold, azure, and white colors, the sacred numbers 3, 5, 7 and 9, and the interlaced cords, all had their traditional meaning. The obligation to secrecy, however, probably applied to the apprentice even before initiation. The atmosphere of these societies seems, even at an early date to have been favorable to liberty of thought and religious toleration. Hence they were prohibited by the council of Avignon, in 1326. The authority of the *Haupthütte* was recognized at the great assemblies of Ratisbon and Strasburg, in 1459, the statutes of which received imperial confirmation. It was legally destroyed by an edict of 1731, long before which time its practical vitality had ceased. England imported much of her lodge organization and learning from Germany. The York charter, on which she based her claim to a native system in the time of Athelstan, is a much later document. This charter contains the famous legend of the craft which derives the seven liberal sciences (masonry being a part of geometry) from the family of Lamech. This science, preserved on a stone pillar from the flood, was taught by Euclid to the Egyptians, and carried by Israel to the building of the temple. Maymus Græcicus brought it to Charles Martel and to England. The first instance of a gentleman or amateur being "accepted" is

that of the antiquary Elias Ashmole (afterward Windsor Herald under Charles II.) who, along with Colonel Mainwaring, was entered at Warrington in 1646. The causes which led to the introduction of a new class of members, and gradually converted operative into speculative masonry, are well stated by Findel, the learned, editor of the German masonic journal *Die Bauhütte*, whose *History of Freemasonry* (translated into English in 1869) is by far the most scientific and complete work upon the subject. The growing spirit of the Reformation in religion gave men a freedom of speech which superseded the marks and caricatures in which the old masons exposed the vices of the church. Toleration was soon a political fact. Science, too, took a new departure from the time of Bacon. The interrogation of nature was preferred to legend and allegory. At the same time a perfectly distinct current of ideas was originated by the Arabian mysticism of Paracelsus and Rosenkreuz, which, after being popularized on the Continent by one of its most decided opponents, Valentine Andree, was preached to the people of England by Robert Fludd, in his *Tractatus Theologico-Philosophicus*.

England.—Modern or speculative masonry may be said to have begun in London on June 24, 1717, "the high noon of the year, the day of light and of roses," when the four London lodges, having erected themselves into a grand lodge, named their first grand master. The leading spirits in this revival were Desaguliers, the well-known popularizer of natural science, and James Anderson, a Scotch Presbyterian minister, who compiled the *Book of Constitutions*, containing the ancient regulations and charges of the craft. From this time new lodges could be formed only by warrant from the grand lodge, but they were empowered to create masters and fellow crafts. In 1721 the duke of Montagu was elected grand warden. He was the first noble who obtained that office. In the strange society of Gormogones, subject to the "sub-œcumenical volgi" at Rome, it is supposed that the Jesuits made a final effort to secure English Freemasonry as a channel for their political influence. At this time, also, the committee of charity was formed, which has since raised and expended very large sums for the relief of distressed brethren, and built the boys' and girls' masonic schools at Battersea Rise and Tottenham. Provincial grand masters were appointed, and charters granted to many foreign lodges. In the latter part of the eighteenth century the ancient York Lodge, backed by several old masons who had been indulging in irregular initiations, put forward a rival claim to be a grand lodge or supreme authority. This claim was rested on the fable of an assembly at York in the year 926. On the orthodox or London side appeared the well-known *Illustrations of Masonry*, by Preston, the pupil of Ruddiman. The schismatics introduced the red color of the royal arch degree, which they represented as something more exalted than the blue degrees of St. John. It belongs to the order of Templars, the legend referring to the second building of the temple. Another branch of Templarism, the grand chapter of Harodim, was founded in London in 1787. The act of 1799 directed against seditious societies, however, makes an exception in favor of the masonic lodges, which, according to the Act, meet chiefly for benevolent purposes. In 1813 a union was at last brought about by the dukes of Sussex, Kent and Athole between the rival grand lodges of London and York, henceforth known as the United Grand Lodge of England. This patronage of aristocratic blood gave an impetus to Freemasonry, and in 1832 Mr. Crucefix, the editor of the *Freemason's Quarterly Review*, succeeded in founding the Freemason's Asylum. The brotherhood showed their good sense in deciding about this

time that Jews might become members of the craft. They also built a hall, established their archaeological institute and "The London Literary Union," and started the *Freemason's Magazine* and the *Freemason*.

America.—The first attempt to introduce freemasonry into America was made in 1730, when a provincial grand master was appointed in New Jersey; but we have no record that he established any lodge under the authority of his deputation. Three years later, however, a lodge was opened at Boston, which was speedily followed by the organization of other lodges in the different colonies. Up to the War of Independence the lodges of America derived their warrants of authority from the grand lodge of England or Scotland, but after the struggle was over and American independence assured, they availed themselves of the privileges belonging to bodies of freemasonry in all independent countries, and organized grand lodges in their respective States. In no other country has freemasonry developed itself faster and showed greater vitality than in the United States; and, though it had to meet at times severe opposition, such as commenced in 1829, by the organization of an anti-masonic party, it has increased numerically with such steady progress, that at the present day the number of its members amounts to over half a million, belonging to several thousand lodges. The privileges of masonry in America have been denied to persons of African descent by the American grand lodges. Although since the war lodges of men of African descent have been established, which claim the sanction of the grand lodge of England, yet they are regarded as "clandestine" or irregular. The basis of this exclusion is the fact that a mason must be born of a free woman, and the negroes, having been in domestic bondage, are ineligible. In May, 1873, a lodge was established by Americans in the city of Jerusalem; and in the preceding year the grand lodge of Italy was opened in Rome itself. In Europe the organization has been frequently used for political purposes, especially as a cloak for conspirators against the governments. By such acts, however, the constitution of freemasonry is violated which forbids all political partisan or sectarian discussions in the lodges. The primary organization of the masonic fraternity is into lodges, which in the first degree must each be composed of at least seven members in good standing. In the other degrees the number constituting a lodge varies. There are several degrees in masonry, the first and lowest of which is that of entered apprentice; the second of fellow-craft; the third of master mason. The officers of a lodge in the United States are worshipful master, senior warden, junior warden, treasurer, secretary, senior deacon, junior deacon, tiler and chaplain. There are also two stewards. Essential to every lodge organization are the master, the wardens, and the tiler, whose latter duty it is to keep the door and guard against intrusion. The officers are elected annually by ballot. In each State of the Union there is a grand lodge composed of the representatives of the subordinate lodges, over which it exercises a certain jurisdiction. Its officers are styled grand and deputy grand masters, grand wardens, grand treasurer, grand secretary, grand chaplain, grand deacons, grand marshal, grand pursuivant, grand sword-bearer, grand stewards and grand tiler. There are also still higher degrees of masonry, those of the mark master, the past-master, the most excellent master, and the royal arch, the members of which are termed royal-arch masons, and form royal-arch chapters, with a special exception in the case of the past-master's degree, which degree every worshipful master of a third degree lodge must take before he can preside in his lodge. The degree, while it is conferred in a chapter of past-masters

is honorary, and does not entitle the recipient to enter a mark-master's lodge (which is a lower degree in regular order). Beyond this there is still a long series of degrees bearing various titles.

FREEPORT, a city of Illinois, United States, the capital of Stephenson county, is situated on the Pecatonica river, 110 miles west-northwest of Chicago. It is a rapidly increasing town, and possesses woolen and carpet manufactories, a foundry, a tannery, a beet-root sugar factory, and various kinds of agricultural implement factories. The principal buildings are the court house and the Presbyterian college, which was instituted in 1872. Population (1900), 13,258.

FREETOWN, a town of West Africa, capital of the British colony of Sierra Leone, stands on the south side of the estuary of the Sierra Leone river, about five miles from the cape of that name. The population in 1901 was 30,033.

FREE TRADE. This expression has been appropriated, in a somewhat technical manner, to denote an unimpeded intercourse between such manufacturing and commercial communities as having reciprocal interests, are under separate governments, and thereupon have separate financial systems. Thus the term is not applied to the facilities which town and country, laborer and capitalist, have obtained for reciprocal exchange, though these facilities have been acquired only in comparatively recent times.

Between nations, free trade represents the well-known principle of the division of employments. The advantages which result from the natural or spontaneous division of employments, and the loss which ensues from a forced division of employments, are the commonplaces of economists. But the fact that exactly the same principle rules the distribution of production over such parts of the world as are occupied by industrial agents is not so frequently insisted on. That there are several commodities which a country cannot produce at all, or can only produce under circumstances so disadvantageous as to involve disproportionate expense or loss, is admitted by every government, however anxious it may be to develop native industry by protective regulations. No European government, however imperfectly civilized, would attempt to direct its home industries into the production of tea, coffee, and chocolate, or to domesticate elephants for the sake of their ivory, or to breed ostriches for the sake of their plumes, or to maintain a race of wild hogs in order to obtain a due supply of bristles from native sources. But there are in most countries a number of industries the continuity of which governments have attempted, and still attempt, to promote, by hindering the free entrance of foreign-made articles of the same kind. It will be found that, historically, this practice has had its origin in what is now understood to be a delusion as to the true functions of the currency.

The control of production and trade in modern Europe is historically due to the development of what Adam Smith called the mercantile system, *i. e.*, the effort of government to secure as far as possible the largest possible amount of specie within the country whose affairs it administered. It is easy to discover the origin of this policy. To a government which spends, but does not produce, the possession of treasure is of the greatest utility and service. To an individual who produces and trades, still more to one who trades only, treasure is, as a rule, the least valuable instrument of traffic, as it is an article from which, as it is affected by the least possible variation in value, the least amount of profit can be anticipated by those who deal in it as an article of trade. A trader in the

Middle Ages would have readily accepted the doctrine that money was wealth as far as regarded everyone but himself; as far as he was concerned, he wished to get rid of his money as soon as he could, in exchange for goods, on which he might secure his profits. The doctrine that the machinery of international trade supplied the process by which the precious metals were distributed, and that therefore, if trade were to exist, the attempts of government to restrain the exportation of money were mischievous or nugatory, was argued as early as the middle of the fourteenth century by Sanuto the Venetian, and by Oresme the bishop of Lisieux, in language as precise as any used by Turgot or Adam Smith. The reasonings, however, by which protective theories were upheld, the mean and malignant arguments of restraint, as Adam Smith calls them, were always strengthened in England up to thirty years ago, by suggesting the hideous consequences which would come on the nation from a drain of gold. Protection had its origin in the reputed duty of government toward the currency. Once established it created artificial interests whose existence was a loss to the whole community, but whose maintenance seemed to be the satisfaction of a contract entered into between the government and the industry which the government had called into being or had stimulated.

It will be clear that if any particular industry is of such a character as to be very conveniently carried out by the inhabitants of a particular community or district, if the producer fears no rival in the home market, and, still more, if he dreads no competition in a foreign market, any protection accorded to his industry must be wholly superfluous. He might even contemplate an export duty with equanimity, though of course an export duty would be destructive of his foreign market if he had real rivals, and he would generally find that such a duty would not only limit the consumption of his product, but would call a rivalry into existence. It is equally clear that if a protective duty were imposed on the importation of foreign commodities into a country which has already a marked superiority over other countries in these commodities, the regulation would have no effect in increasing either the profits of the producer or the cost of the article to the consumer,—that, in short, the enactment would be absolutely nugatory. It will be also plain that, in every country, there are certain commodities which are effectually shielded from foreign rivalry by the cost of carriage, and that such commodities possess the superiority which other products enjoy from the peculiar facilities which a particular country has in manufacturing them.

The positions stated above receive a significant but complete illustration from the economical history of England. A century ago the English landowners were free traders, the English merchants protectionists. Adam Smith rested all his hopes of a better system on the former class, but despaired of any co-operation from the latter. Twenty years after the *Wealth of Nations* was published, the mercantile and manufacturing classes, with few exceptions, were free traders; the landowners, with few exceptions, were protectionists. The explanation of the change in sentiment is to be found in the change of interests. Up to the middle of the eighteenth century England exported considerable quantities of agricultural produce—sometimes naturally, at other times under the wholly indefensible stimulus of a bounty on exportation. Now it needs very little intelligence to discover that the profits of an exporter, or at any rate the extension of his trade, depend largely on the variety of imports which he can obtain in exchange for his

goods. A country which puts no hindrance on imports always deals to the greatest advantage, and the advantage decreases with restraint. If a country refused to admit any import but one, *i. e.*, money, it would sell its exports in the worst possible market, and for the least possible value, receiving in return an article which the machinery of its trade takes the most effectual possible means to depreciate.

It may be believed that, in England at least, the question of protection to manufactures is finally settled, though there are not wanting persons who advocate reciprocity, coördinate taxation on foreign products, retaliatory duties on reputed bounties, and the like. But the traditions of legislation are too firmly fixed, and the benefits of free trade experienced during the past thirty years are so generally admitted, that the advocacy of the exploded theory of protection is looked on as a harmless whim which has no chance of popularity. It is not perhaps equally clear that the English people are quite safe against the revival of protection to agriculture under the pretense of sanitary restraint, for that which is the inevitable result of protection to manufacture, the limit of voluntary consumption, is not so markedly developed from the protection which may be accorded to articles of necessary consumption.

When trade is restrained in those articles of foreign origin which may be produced, though under less advantageous circumstances, at home, and the product is an article in which the use may, to a limited extent only, be economized, the following results ensue:—Prices rise, and profits rise,—of course, at the expense of the consumer; wages, however, do not rise, for in so far as wages are determined by the competition of employers for services, the tendency is toward a reduction of wages, seeing that the use of the product is not increased but rather stinted. Now the extra profits which protection accords might be secured to those who are already employed in the particular industry thus favored only if the producers have a natural monopoly in the produce of their calling, as was practically the case with the English landowners during the existence of the corn laws, or if the law restrains other persons from competing against them, as was the case in England with Eastern produce during the continuance of the East India Company's chartered trade. If such an advantage be not accorded, capital makes its way to the favored industry; or, to be more accurate, an increasing number of employers compete for the exceptional profit. Such an operation may in some degree raise the rate of wages, though here again, unless the labor be protected by some arrangement, such as apprenticeship, or by the machinery of a strict trade union, the same cause which attracted the energies of the employer will rapidly, even more rapidly, supply what may be needed in the way of labor.

There is a well-known passage in Mr. Mill's political economy in which this author conceives it expedient that protection should be given to certain industries in new countries, provided that the country had good natural resources for the successful prosecution of such an industry, and the protection accorded be only temporary. But apart from the fact that new countries never possess a superfluity of capital and labor, and therefore are least of all well advised in directing these elements of wealth into channels where they would be less advantageously employed than they would be in others; apart from the considerations that all countries have a natural protection in the cost of carriage, and in the comparative ease with which they can interpret demand; and apart from the fact that good natural advantages for any particular

industry are sure to suggest that industry at the very earliest time at which it will be expedient to undertake it—the circumstances which invariably affect a protected industry render it impossible that Mr. Mill's rule of a temporary protection should be applicable. Who is to determine at what time the protection should be removed? Not the consumer, as represented in the legislature, for he would naturally object to the protection from the beginning, since the regulation inflicted a loss on him, at the very instant that it came into operation. Not the manufacturer, for until the time comes in which he dreads no rivalry, he believes that the regulation is the guarantee of his ordinary profit, and that its removal will expose him to certain loss. The probability that he may come to such a state as to render the protection manifestly superfluous depends on his making some great, sudden and lasting stride in the efficiency of the industry which he exercises.

It may be concluded then, that, while Mr. Mill has given a doubtful defense for the adoption of a temporary protection, his limits to the protection so accorded will be found to be practically nugatory, and that, in fact, the adoption of the system will confer the minimum of good, while the abolition or abandonment of it will inflict the maximum of injury. This result then—the creation of factitious industries, which cannot be assisted by the operations of government without loss to the consumer, but which cannot be abandoned by government without ruin, real or apparent, to the consumers—is substantially the apology and defense for the protective systems of Continental Europe. For there is nothing which characterizes modern systems of government more than the tenderness which all parties show toward imperiled interests. There is a growing disposition toward treating them as vested—that is, as equitably entitled to compensation if their continuity is disturbed or even threatened. Of course, there must be a limit to this consideration, for no government has yet ventured on admitting, however democratic may be its institutions, the vested interests of manual labor, or allowed that it should be compensated, if events required that a change be made in legislation which might interfere with the continuity of its wages. But if the project which is in favor with certain schools of socialism in France and Germany, that the state should assist labor (and of course, it could assist only special kinds of labor) with government subventions, the doctrine of vested interests would assuredly be applied to such assisted callings.

The great advantage which free trade has bestowed on English manufactures consists in the fact that it has enabled the producer to interpret accurately the cost of production, and therefore to discover the prospect which his industry has of a remunerative market. It is superfluous to protect an industry which is strong enough to assert itself in the rivalry of competition. It is similarly superfluous to protect an industry the products of which, by reason of their bulk and cheapness, are shielded from competition by the costs of carrying the same products from foreign parts, or even from remote districts within the same political system. It may be inferred, therefore, that protection is not demanded except in cases where the industry would be exposed to the dangerous or successful rivalry of the foreign manufacturer, and therefore is carried on under circumstances which, by increasing the cost of production, render the employment of labor and capital on the same industry in question a less advantageous outlay than they could be in other objects. If it comes to pass that under favorable circumstances the protected industry can cope with un-

protected rivals in a common market, it is clear that the necessity for protection has passed away, and that the existence of the restraint is needless and vexatious. Thus, for example, if it be true that American cotton cloth can successfully compete against Manchester goods in China, or Japan, or Central Africa, it can, *a fortiori*, compete successfully against Manchester goods in the United States itself. But it also follows that, if this position be not attained, the existence of the restraint is a constant impediment to its being attained, because the industry, as estimated by the cost at which its product is attained, invariably accommodates itself to the circumstances which naturally or artificially control its production, especially in reference to the amount of capital and labor devoted to it, and the rate of profit which the manufacturer enjoys. There is no reason to believe that in the protected manufactures of Germany, France and the United States the profit of the manufacturers is greater than is derived from unprotected industries—that, for example, the French ironmaster or cotton-spinner gains a greater advantage from his calling than the wine-grower does. On the contrary, the loudest complaints of declining trade, and the baneful influence of foreign rivalry, are heard from the industries which have successfully demanded the assistance of protective duties. It is always the case, and it always will be the case, that the opulence and prosperity of a country will depend on the success with which its natural industries are prosecuted, and on the prudence which it shows in hitting the proper time in which other industries may be attempted with a reasonable prospect of remunerative profit. For just as weakly plants and animals are the first to succumb to those climatic or atmospheric conditions which are unfavorable to health and vigor, as in the struggle for existence feeble stocks disappear and more energetic forms occupy their place, so industries which need artificial support are the first to feel commercial adversity, and the last to recover from it. It is stated, and the statement is not seriously controverted, however much the true interpretation of the facts is disguised or resisted, that during the period of commercial depression which began after 1874 the countries in which the greatest efforts have been made to sustain artificial industries have suffered more than England, which has conceded no such assistance whatever.

But it is not only in the fact that the producer is able in an atmosphere of free action to interpret the prospects of his own market best, and to solve most readily the problem as to what is the relation between cost of production and possible profit, that the value of free-trade principles is discerned. The same principles which in England have been happily recognized as fundamental have indirectly done more to soften the differences between employer and laborer than anything else. No civilized country has had more reason to fear the consequences of hostility between capital and labor than England has. For nearly five centuries the legislature of that country strove to regulate the rate of wages in the interest of employers. To the numberless and severe statutes of laborers, which began with 1350 and were continued in full force up to 1825, when they were relaxed rather than repealed, is due the English poor law in the first place and the trade union in the second. It was natural, when the English government had been attempting for so long a time to keep down wages by law, and looked with so much hostility on any organization among the working classes which seemed likely to better their lot, that when the severity of these laws was relaxed the laborers should eagerly adopt the

machinery from the use of which they had been so long debarred. But deplorable as has been the combat between labor and capital, and blameworthy as many acts have been on both sides, no one who has given any attention to the subject can fail of noticing that the aims of the trade unions are simple and intelligible, that the representatives of these combinations court debate, criticism and sympathy from the public to which they appeal, and that the struggle is carried on with increasing mildness and forbearance. The English unions do not aim at reconstructing society, nor demand subventions from the state as a means by which they may resist the power of the capitalist, nor adopt those projects which give from time to time such trouble to Continental governments. The fact is, the English parliament has withdrawn all artificial aids from the capitalists, and the workman is content to stand on the same level with his employer as far as the state is concerned. But where, as in other parts of the civilized world, the state, for some reason or the other, has determined on fostering the existence of an industry which cannot exist without state help, or does not think it can, the workman is sure to attempt, with what success he can, either to appropriate a part of the extraordinary profit which the government, in the early stages of its action accords to the capitalist, or to demand that an analogous benefit should be conferred on him by the operation of law. The protective system of Continental Europe is the source and the strength of European socialism, and is responsible for its fallacies and its excesses. Those Englishmen who lived through and watched the simultaneous energies of the Chartist movement and the free-trade agitation had abundant opportunities for inferring what turned out to be the fact, that the success of the latter movement would be a deathblow to the former project. Government in England interferes very little with the action of individuals, but this is possible because government in England abstains as much as possible from meddling with those relations which can be made to adjust themselves. In England the adage of Mr. J. S. Mill, that "the best remedy for the evils of liberty is more liberty," may be a wise generalization, but when the liberty of labor is curtailed, it is not quite so clear that a government can with safety to itself dispense with that control from which English social life is happily free.

With the exception of these and analogous instances, —when the safety and morals of the public justify, to a larger or smaller extent, the supervision of the state over the free choice of industry,—the concession of that free trade in labor which puts the minimum of hindrance on the field of employment and the character of employment which the producer selects is quite as important to the well being of a state as the concession of a free agency to its capital and a free market for its products. For as all wealth is the produce of labor, and as the efficiency of labor is the first and last condition of national progress, as the efficiency of labor is primarily brought about by the division of employments, and as the division of employments knows no limit as long as the market of products is extended, so it is of the highest interest to the efficiency of labor that the field of its operations should be as open and free as possible.

It may be added to all the above that there are many and weighty arguments urged in favor of the protective tariff policy in effect in the United States during the past thirty years. The entire question is changed in the minds of a large number of people by the questions of expediency, locality, age of manufactures, and

location. It is urged, without going at large into the argument, that the country has been exceedingly prosperous under a protective tariff system—an argument requiring no theoretical demonstration; that the situation of England imperatively demands free trade, while ours is a situation to which protection is an economical necessity. On the other hand, that free trade in the United States would be of enormous commercial advantage to England, and that all the arguments adduced by the Cobden school are based upon that fact, or are at least promulgated and advanced for selfish ends.

The protective system cannot be said to be the final and settled policy of the United States. It is experimental. Though outwardly it is the almost sole question now at issue between the two great parties, it is in its essence not a question of politics, but an economical one, destined to be settled by long experience in results and effects. There are therefore innumerable free-trade republicans and a large body of protectionist democrats. The attempt to draw the lines closely has failed so far as party action is concerned, the result being only to cause the general public to begin a process of thinking, with a view to action at some future time, without haste, and with no special view to parties or party welfare.

The time of this writing is after the general election of 1893. By free-traders and the advocates of a modified protective tariff alike a victory is claimed in that election. The same conclusion is reached by the strict advocates of protection-for-revenue-only. But to one who is disposed to consider the great question outside of his connection with any party, and who is indisposed to use his sentiments or his conclusions for party benefit, this last result at the polls does not bring any definite conclusion except that the final verdict of the public upon the question cannot as yet be definitely foretold, and that so far it has only expressed its opposition to extreme tariff measures and demands a modification of them. There is evidently a feeling that the truth lies between two extremes, that previous to the final decision that the country shall adopt free trade a means must be found for the raising of the enormous revenue that must come from some source, and that does now come from the tax on imports. The question of lowering his wages to the grade established for the British skilled mechanic disturbs the mind of the workman notwithstanding the compensating advantages that it is alleged will accrue to him. The arguments which emanate from foreign sources and have been industriously disseminated excite suspicion in his mind. The conclusion as to the present status of the question which is forced upon the dispassionate and non-partisan observer is that it is by no means yet decided; that the advocates of extreme protection have been rebuked; that the safe experiment of a modified tariff is to be tried, and that upon future results will the final decision of the question depend.

No argument has so little affected the American public as that one which is based upon the morals of the question. Only theorists are as yet ready to seriously maintain that because mankind should be a band of brothers it is morally wrong to still continue to act as though they were not. It is in this country extensively believed that the individual, the family, the community, the State and the nation has so far a moral right to adopt such selfish measures as are necessary to the furtherance of its own welfare. Every person practically follows this rule in his business and private affairs, both in the United States and elsewhere.

It is agreed to by all parties to the controversy in the United States that free trade may finally become the policy of every civilized nation. But existing circumstances now control the situation. They may change or may be made to change. Nothing sudden or radical is to be expected, and when such change is advocated men of all parties demur. The question is by no means one-sided. The arguments adduced by both parties are seen by the public to be cogent, and in many cases, both views are in a sense indisputable.

FREEWILL BAPTISTS, a denomination of Baptists in the United States and Canada, holding similar doctrines to those of the General Baptists of England. Founded in 1780 by Benjamin Randall, a Baptist preacher, who had been censured for teaching anti-Calvanistic doctrines, it soon made considerable progress, and, in 1827, a general conference, meeting every three years, was instituted. Besides erecting numerous schools of different grades, the Freewill Baptists have established three colleges, one at Lewiston, Me., one at Ridgeville, Md., and a third at Hillsdale, Mich., to which both sexes, and colored people as well as whites, are admitted. A fourth college has since been erected at Rio Grande, Ohio. In 1889 the denomination had 1,619 churches in the United States, with 1,414 preachers, and 86,201 communicants. In Nova Scotia and New Brunswick there is a separate conference, the membership connected with which is upward of 9,000.

FREEZING MIXTURES, AND OTHER MEANS OF COOLING. When matter passes from the solid into the liquid state, heat in large quantities disappears. When a piece of ice, having a temperature of 32° F., is placed in its own weight of water at 174°, we find, on testing the water with the thermometer after the ice has melted, that its temperature is 32°; the heat which the water contained having disappeared during the melting of the ice. Ammonia and sulphuric ether are much used to create artificial cold, and in many American breweries are used instead of ice. For **ICE MACHINES** and **COLD STORAGE** see **Art. ICE**.

FREIBERG, or **FREYBERG**, a town of Saxony, is situated on the Münzbach, not far from its confluence with the Mulde, and nineteen miles southwest of Dresden. Population in 1900, 30,175.

FREIBURG, or **FRIBOURG** (the French form of the name), a canton of Switzerland, is situated in the district to the southeast of the lake of Neuchâtel and the northeast of the lake of Geneva. Population (1900), 127,951.

FREIBURG, the chief town of the above canton, with a station on the line between Bern and Geneva, occupies a highly picturesque situation in the valley of the Sarine, part of it lying in the bottom of the ravine and part of it climbing the irregular eminences on the left. Population, 13,000.

FREIBURG, or **FREYBURG**, usually distinguished as Freiburg in the Breisgau, is a city formerly of the Austrian dominions but now in the grand-duchy of Baden, about twelve miles east of the Rhine, at the foot of the Schlossberg, one of the heights of the Black Forest range. Population, (1901), 61,506.

FREIBURG, distinguished as Freiburg unter dem Furstenstein, a garrison town in the government district of Breslau, Silesia, is situated on the Polnitz, thirty-five miles southwest of Breslau. Population, 8,000.

FREIDANK, **FREIGEDANK**, or in Middle High German, **VRIDANC**, the name by which a certain German didactic poet of the thirteenth century is usually known. It has been disputed whether the word, which

is equivalent to freethought, is to be regarded as the poet's real family name or only as a pseudonym; according to Pfeiffer the former is the case.

FREILIGRATH, FERDINAND, a popular German poet, was born June 17, 1810, at Detmold, where his father was a teacher in the *Stadtschule*. His first volume, published at the age of twenty-eight, made him the favorite poet of his day, and it was not long before he was drawn into political expression in his poems and writings and was compelled to fly from his native country in 1844. He returned, however, on the proclamation of amnesty to political offenders, but was again compelled to flee in 1851. He remained in England till 1868. In 1866 a national testimonial, which ultimately reached the sum of 60,000 thalers, was set on foot in Germany, for the purpose of providing a pension for the poet in his old age; and when, two years later, a general amnesty was granted to political offenders, Freiligrath returned to his native country, and was received with public enthusiasm. He now settled in Stuttgart, where, at the beginning of the Franco-German war, he wrote some since popular songs, such as *Hurrah Germania!* and the *Trompete von Gravelotte*. He removed to Cannstadt in 1875, and died there, March 18, 1876.

FREIND, JOHN, English physician, was born in 1675 at Croton, in Northamptonshire. In 1722 he entered parliament as member for Launceston, in Cornwall, but, being suspected of favoring the cause of the exiled Stuarts, he spent half of that year in the Tower. During his imprisonment he conceived the plan of his most important and valuable work, *The History of Physic*, of which the first part appeared in 1725, and the second in the following year. In the latter year he was appointed physician to Queen Caroline, an office which he held till his death, July 26, 1728.

FREIRE, FRANCISCO JOZE (1713-1773), a Portuguese historian and philologist, was born at Lisbon.

FREISCHÜTZ is, in German folklore, a marksman who, by a compact with the devil, has obtained a certain number of bullets destined to hit without fail whatever object he wishes. As the legend is usually told, six of the *Freikugeln* or "free bullets" are thus subservient to the marksman's will, but the seventh is at the absolute disposal of the devil himself. Stories about the Freischütz were especially common in Germany during the fourteenth, fifteenth and sixteenth centuries; but the first time that the legend was turned to literary profit is said to have been by Apel in the "Book of Ghosts." It has become universally known as the basis of Weber's opera *Der Freischütz* (1821), the libretto of which was written by Frederick Kind, who had suggested Apel's story as an excellent theme for the composer.

FREISING, FREYSING, or FREISINGEN, a town of Bavaria, district of Upper Bavaria, is situated on the Isar, twenty miles north-northeast of Munich.

FRIEWALDAU, a town in Austrian Silesia, circle of Troppau, is situated in a pleasant valley forty miles west-northwest of Troppau.

FRÉJUS, the ancient *Forum Julii*, a town of France, department of Var, about a mile from the Mediterranean. At St. Raphael, a fishing village about a mile and a half distant, Napoleon disembarked on his return from Egypt in 1799, and reëmbarked for Elba in 1814.

FREMONT, the county seat of Dodge county, Nebraska, is situated on the north bank of the Platte river, forty-seven miles west-northwest of Omaha, on the Union Pacific railroad. It is a considerable shipping point for grain, and has some manufactures, ten churches, good schools, three national and two savings banks, and a population (1900) of 7,241.

FREMONT, a city of the United States of America, capital of Sandusky county, Ohio, is situated on the Sandusky river, at the head of navigation, thirty miles east of Toledo by rail. Steamers ply between the city and the principal ports of Lake Erie, and it has manufactories of woollens, sashes and blinds, flour mills, and engineering works. Population in 1900, 8,439.

FRENCH, NICHOLAS, an Irish political pamphleteer, was born in Wexford in 1604. Shortly before his death, which took place August 23, 1678, he was nominated coadjutor-archbishop of Ghent.

FRÈRE, JOHN HOOKHAM, an English diplomatist and author, was born in London, May 21, 1769. He entered public service in the foreign office under Lord Grenville, and sat from 1796 to 1802 as member of parliament for the close borough of Looe in Cornwall. On Canning's removal to the board of trade in 1799, he succeeded him as under secretary of state; in October, 1800, he was appointed envoy extraordinary and plenipotentiary to Lisbon; and on September, 1802, he was transferred to Spain, where he remained for two years. After the disastrous retreat of Sir John Moore to Corunna, the public accused Frère of having by his advice endangered the British army, and though no direct censure was passed upon his conduct by the government, he was called home, and the Marquis of Wellesley was appointed in his place. He died in Malta in 1841.

FRERET, NICOLAS, a French scholar, one of the most learned men of his age, was born at Paris, February 7 or 15, 1688. Among his early studies history, chronology, and mythology held a prominent place. He was hardly twenty-six years of age when he was admitted as pupil to the Academy of Inscriptions. His multifarious pursuits left him no time for carrying on the publication of the *Mémoires* of the Academy, an enormous arrear of which had to be made up by his successor. He died at Paris, March 8, 1749.

FRÉRON, ÉLIE CATHERINE (1719-1776), a French critic and controversialist, was born at Quimper. Fréron is now remembered solely for his attacks on Voltaire and the Encyclopedists, and the fame of his criticisms is not due to their inherent merits, which, notwithstanding a certain clever malignity, are very slight, but to the retaliations they provoked on the part of Voltaire.

FRÉRON, LOUIS STANISLAS, a French Revolutionist, son of the preceding, was born at Paris in 1765. On the outbreak of the Revolution, Fréron, who was a schoolfellow of Robespierre and Camille Desmoulins, established the violent journal *L'Orateur du Peuple*. Commissioned along with Barras in 1793 to establish the authority of the Convention at Marseilles and Toulon, he distinguished himself equally with his colleague in the atrocity of his reprisals, but both afterward joined the Thermidoriens, and Fréron became the leader of the *Jeunesse Dorée*. He died in 1802 at St. Domingo, where he was for a few months subprefect.

FRESCO. Fresco-painting is the art of mural painting upon freshly-laid plaster lime while it remains damp, with colors capable of resisting the caustic action of the lime with which they are mixed or brought into contact. The art of painting with colors mixed with lime is very ancient; it was in use in Egypt from the remotest periods of the monumental history of that country. The colors used were earths, which were mixed with lime and laid on in flat tints, and earths for the most part are the colors still employed in fresco-painting. The Romans probably owing to Greek influence and example, carried the art much further than their Etruscan predecessors, and established real fresco-painting in Italy. Vitruvius remarks, "colors when carefully applied on moist stucco do not

therefore fade, but last forever. Stuccoed walls, when well executed, do not easily become dirty, nor do they lose their colors when they require to be washed, unless the painting was carelessly done, or executed after the surface was dry." This is emphatically descriptive of fresco-painting. In this art it is essential that a given amount of plaster be laid for the painter at one time,—in modern practice only enough for a day's work,—and therefore frescoes are readily recognized by the joinings in the plaster, most frequently following the outlines of the figures or other objects. These joinings vary in distinctness in different works according to the skill of the plasterer.

FRESCOBALDI, GIROLAMO, a celebrated musical composer was born at Ferrarai in 1587. Frescobaldi's compositions show the consummate art of the early Italian school, and his works for the organ more especially are full of the finest devices of fugal treatment. He also wrote numerous vocal compositions, such as canzone, motets, hymns, etc., a collection of madrigals for five voices being among the earliest of his published works. The year of his death is not sufficiently established.

FRESNEL, AUGUSTIN JEAN (1788–1827), an illustrious French physicist, the son of an architect, was born at Broglie, in the department of Eure, in France.

FRESNILLO, a town of Mexico, in the state of Zacatecas, is situated thirty miles northwest of Zacatecas, on a branch of the Santiago river, in the plain which divides the mountains of Santa Cruz and Deganos from the Zacatecas range. Population (1900) about 16,000.

FRESNO, the county seat of Fresno county, California, is in the exact center of the State, 207 miles southeast of San Francisco, on the Southern Pacific railroad. The population in 1900 was 12,470. Fresno lies in the fertile San Joaquin valley, and while formerly devoted to grain and stock raising, the country is now mainly given up to fruit growing. The raisin crop of Fresno proper aggregates 10,000,000 pounds annually, and 2,500,000 gallons of wine are produced each year. Oranges, figs, and olives are also largely grown, as well as the more hardy fruits. The manufactures of Fresno comprise machine shops and foundries, agricultural implement works, marble and stone cutting yards, and extensive flouring mills. The county of Fresno contains a million acres of heavily timbered land, from which 15,000,000 feet of lumber are annually cut. Thirteen saw mills are in operation. Among the public buildings of the city are the court house, occupying a block and costing \$60,000; a masonic temple, a club house, nine churches, three hotels, high and graded schools. There are two national and three private banks, and two daily and three weekly papers. The city is lighted by electricity, has water-works and street railways.

FRESNOY, CHARLES ALPHONSE DU (1611–1665), a painter and writer on his art, was born in Paris, son of an apothecary.

FREUDENSTADT, a town of Württemberg, circle of the Black Forest, on the right bank of the Murg, forty-two miles west-southwest of Stuttgart.

FREUDENTHAL, a town of Austrian Silesia, circle of Troppau, on the Black Water, twenty-two miles west of Troppau. Population about 8,000.

FREYA, in Teutonic mythology, one of the Vanen, or spirits of the breathing wind, which have their abode in Vansheim, or middle air between the upper and under world. Freya, or Fregga, becomes the wife of Odur or Woden (Odin), and the mother of Jörd, the earth, thus answering to the Greek Demeter. In the myth of Thor, whose hammer is stolen by the giant

Thoyrn, Freya lends her feather garment to Loki, and thus enables him to go in search of it. Thoyrn refuses to give it up, unless Freya will consent to be his wife; and as Freya will not go, Thor, on the advice of the Heimdall, descends to Jötunheim in the disguise of a bride, and Thoyrn, taking the god to be Freya, meets his doom at his hands at the moment of his fancied nuptials.

FREYCINET, LOUIS, CLAUDE DESAULSES DE, French navigator, was born at Montelimart in Dauphiny, 1779. In 1793 he entered the French navy. After taking part in several engagements against the English, he joined in 1800, along with his brother Henri Louis (1777–1840) who afterward rose to the rank of admiral, the expedition sent out under Captain Baudin in the *Naturaliste* and *Géographe* to explore the south and southwest coasts of Australia. Much of the ground already gone over by Flinders was revisited, and new names imposed by this expedition, which claimed credit for discoveries really made by the English navigator (see FLINDERS). In 1805 Louis returned to Paris, and was intrusted by government with the work of preparing the maps and plans of the expedition. In 1817 he commanded the *Uranie* in which Arago and others went to Rio de Janeiro, to take a series of pendulum measurements. Freycinet was admitted into the Academy of Sciences in 1825, and was one of the founders of the Paris Geographical Society. He died August 18, 1842.

FREYTAG, GEORG WILHELM FRIEDRICH, Arabist, was born at Lüneburg on September 19, 1788. Besides publishing a compendium of Hebrew grammar and a treatise on Arabic versification, he edited two volumes of Arabic songs and three of Arabic proverbs. But his principal work was the laborious and praiseworthy *Lexicon Arabico-Latinum* (1830–37), which rapidly superseded the earlier lexicons, and which, though not to be compared with the magnificent effort of Lane, is likely to remain long in current use as embodying the best results of the labors of De Sacy and his school.

FRIAR, from the Latin *frater* through the French *frère*, a secondary form of a word which is common to all the Aryan languages, is a name commonly applied in English to any lay member of any mendicant order. One who has received ordination is usually dignified with the appellation of father. The church of Rome at present recognizes a considerable number of mendicant orders; but at the time when the word first became current in England, there were practically only four, namely, those which alone had been sanctioned by Pope Gregory X. at the second council of Lyons in 1274. They were the Eremite or Austin Friars, the Carmelites or White Friars, the Dominicans or Black Friars (sometimes also called preaching friars), and the Franciscans, Minors, or Gray Friars. See MONACHISM, CARMELITES, DOMINICANS, FRANCISCANS.

FRIBOURG. See FREIBURG.

FRICTION is the resistance which every material surface presents to the sliding of any other such surface upon it. This resistance is due to the roughness of the surfaces; the minute projections upon each enter more or less into the minute depressions on the other, and when motion occurs these roughnesses must either be worn off, or continually lifted out of the hollows into which they have fallen, or both, the resistance to motion being in either case quite perceptible and measurable. Friction is preferably spoken of as "resistance" rather than "force," for a reason exactly the same as that which induces us to treat stress rather as molecular resistance (to change of form) than as force, and which may be stated thus:—although friction can be utilized as a moving force at will, and is continually so used, yet

it cannot be a primary moving force; it can transmit or modify motion already existing, but cannot in the first instance cause it. For this some external force, not friction, is required. The analogy with stress appears complete; the motion of the "driving link" of a machine is communicated to all the other parts, modified or unchanged as the case may be, by the stresses in those parts; but the actual setting in motion of the driving link itself cannot come about by stress, but must have for its production force obtained directly from the expenditure of some form of energy. It is important, however, that the use of the term "resistance" should not be allowed to mislead. Friction resists the motion of one surface upon another, but it may and frequently does confer the motion of the one upon the other, and in this way causes, instead of resists, the motion of the latter.

FRIEDLAND, a town of Bohemia, the chief town of a circle, is situated in the valley of the Wittich at the confluence of that river with the Ratzitz, fourteen miles east of Zittau. Population, 5,000.

FRIEDLAND, a town of Germany, in the grand-duchy of Mecklenburg-Strelitz, circle of Stargard, is situated on the Mühlenteich, thirty-five miles northeast of Strelitz. Population about 6,000.

FRIEDLAND, a town of Prussia, in the government district of Königsberg, province of Prussia, is situated on the Alle, twenty-seven miles southeast of Königsberg. At Friedland Napoleon gained a victory over the Russians under Bennigsen (June 14th), which led to the peace concluded at Tilsit July 7, 1807.

FRIEDLAND, VALENTINE. See TROTZENDORF.

FRIENDLY ISLANDS. The group thus named by Captain Cook, and otherwise called after the name of its chief island Tonga, was discovered by Tasman in 1643. It lies in the South Pacific, on the southwest limits of the area occupied by the Polynesian race, about 350 miles south-southwest from Samoa, and 250 east-south-east from Fiji. The long chain of islands numbers about 150, with a collective area hardly exceeding 400 square miles.

FRIENDLY SOCIETIES are a British institution, inaugurated among the poorer classes for mutual assurance against the distress arising from sickness, death, accident or other causes of destitution. The formation of these societies dates from the beginning of the eighteenth century. They were at first merely a banding together of a few persons on unscientific principles, but of late years they have been subjects of parliamentary action, and they are now limited by law to operation on a basis founded on the experience deduced from the actuaries' tables of insurance. They are limited to annuities of £50 and gross premiums of £200.

FRIENDS, SOCIETY OF. See QUAKERS.

FRIES, ELIAS MAGNUS (1704-1878), an eminent Swedish botanist, was born at Smaland.

FRIES, JACOB FRIEDRICH (1773-1843), a distinguished post-Kantian writer on philosophy, was born at Barby, Saxony.

FRIESLAND, or **VRIESLAND**, sometimes called West Friesland, to distinguish it from East Friesland in Hanover, is the most northerly province of the Netherlands. It is bounded on the southwest, west and north by the Zuyder Zee and the North Sea, on the east by the provinces of Groningen and Drenthe, and on the south-east by that of Overijssel. Pop. (1901), 342,286.

FRIGATE (probably connected with the Goth. *fargod*, a row-galley, and also with the Lat. *aphractus*, an undecked galley), formerly, a long narrow vessel propelled by oars and sails, used in the Mediterranean on occasions when speed was requisite. The name then came to be applied to men-of-war, of a class smaller

than line-of-battle ships, and carrying from twenty to fifty guns, which were employed in the great wars of the eighteenth century and early part of the nineteenth century, as scouts and cruisers. The frigate was usually swift, easily managed, and capable of beating well up to the wind. She became, therefore, the favorite ship in war-time, and bore off a large proportion of the prize-money. With steam, and the growth of the fleet in later times, frigates were developed more than any other men-of-war, and many of the largest ships belonged to this class.

FRIGATE-BIRD, the name commonly given by the sailors, on account of the swiftness of its flight, its habit of cruising about near other species and of daringly pursuing them, to a large Sea-bird—the *Fregata aquila* of most ornithologists.

FRISCHLIN, NICODEMUS, scholar and poet, was born September 22, 1547, at Balingen, Württemberg, where his father was parish minister. He was educated at Tübingen, and in 1568 was promoted to the chair of poetry and history. In 1575 for his comedy of *Rebecca*, which he read at Ratisbon before the emperor Maximilian II., he was rewarded with the laureateship and with the honor of knighthood. Some time afterward he was made a comes palatinus. In 1582 his unguarded language and his reckless life had made it necessary that he should leave Tübingen; he accordingly accepted a quiet mastership at Laibach in Carniol, which he held for about two years. Shortly after his return to the university in 1584, he was threatened with a criminal prosecution on a charge of immoral conduct, to which it was alleged, he had exposed himself some years previously, and the threat led to his withdrawal to Frankfurt in 1587. Of the remaining four years of his life little is recorded.

FRISI, PAOLA, a celebrated mathematician and astronomer, was born at Milan in 1728. In 1753 he was elected a corresponding member of the Paris Academy of Sciences, and shortly afterward he became professor of philosophy in the Barnabite College of St. Alexander at Milan. An acrimonious attack by a young Jesuit, about this time, upon his dissertation on the figure of the earth laid the foundation of his animosity against the Jesuits, with whose enemies, including D'Alembert, Condorcet, and other Encyclopedists, he later closely associated himself. In 1756 he was appointed by Leopold, grand duke of Tuscany, to the professorship of mathematics in the University of Padua, a post which he held for eight years. He was made in 1757 an associate of the Imperial Academy of St. Petersburg, and a foreign member of the Royal Society of London, and in 1758 a member of the Academy of Berlin, in 1766 of that of Stockholm, and in 1770 of the Academies of Copenhagen and of Bern. From several European crowned heads he received, at various times, marks of special distinction, and the empress Maria Theresa granted him a yearly pension of 100 sequins (£50). He died November 22, 1784.

FRISIANS, a people of Teutonic stock, who, at their first appearance in history, are found in possession of the same district of Europe which they still, at least partially, occupy. So far as can be judged they have never been of an aggressive disposition, and it is not improbable that at one time they may have possessed a much wider territory than history usually assigns them. The boundaries of Frisia proper are the Scheldt toward the west, and the Weser toward the east, and it never extended far inland from the coast of the German Ocean. But there is also a district of Schleswig in Denmark, extending along the west coast from the Røder northward to Töndern, in which the common language still gives evidence of a Frisian population;

the same may be said of the neighboring islands of Föör, Silt, Heligoland, etc.; and it is no improbable supposition that not only the Ditmarsch district to the south of the Eider, but also the whole maritime country westward to the Weser, was at an earlier period in the hands of distinctly Frisian tribes. If the presence of geographical names ending in *um*, the Frisian equivalent to the German *heim* and the Saxon *ham*, may be taken as sufficient evidence of Frisian occupation, Doctor Latham, in his notes to the *Germania* of Tacitus, has elaborately shown that there have been Frisian settlements as far north in Denmark as the Lijmfjord, and as far east as the islands of Funen and Zealand. By the older historians of Denmark and the countries of Lower Germany, the Frisian district in Denmark is frequently called *Frisia Minor* or Lesser Frisia, which, however, must not be confounded with the unexplained distinction which Tacitus makes between *Frisii Majores* and *Frisii Minores*.

The history of the Frisians, in spite of the labors of a few investigators like Wiarda and Richthofen, has hitherto been left in many respects in a very fragmentary and untrustworthy condition; and rash assertions of uncritical chroniclers have undisputed currency. For this neglect the principal reason is undoubtedly the fact that the people have, at least in modern times, displayed no strong political individuality, but have allowed themselves peacefully to be merged in more powerful nationalities.

The Frisian language is a member of the Low German branch of the Teutonic, and presents special interest to the English philologist as the nearest of all extant forms to the Saxon basis of his own tongue. It is still spoken in the country districts of the present province of West Friesland; in a much more Germanized condition it still exists in Saterland, in East Friesland; in strangely differentiated dialects it holds its own in many of the islands along the coast; and, in spite of the encroachments of Low German on the one hand, and Danish on the other, it survives in the country between Husum and Töndern.

FRITH or FRYTH, JOHN (*cir.* 1503–1533), an eminent pioneer of the Reformation in England, was born at Westerham, Kent, where his father kept an inn. He was educated at Eton, and afterward at King's College, Cambridge, where Gardiner, who subsequently became bishop of Winchester, was his tutor. Frith's first publication in fact was a translation of Hamilton's *Places*, made shortly after the martyrdom of their author; and soon afterward the *Revelation of Antichrist*, a translation from the German appeared, along with *A Pistle to the Christen Reader*, by "Richard Brightwall" (supposed to be Frith), and *An Antithesis wherein are compared together Christes Actes and our Holye Father the Popes*, dated "at Malborow in the lande of Hesse," July 12, 1529. His *Disputacyon of Purgatorye*, a treatise in three books, against Rastell, Sir T. More, and Fisher (bishop of Rochester) respectively, was published at the same place in 1531. In 1532, probably in July or August, he ventured back to England, apparently on some business to which he and Tyndal attached importance in connection with the prior of Reading. Warrants for his arrest were almost immediately issued at the instance of Sir T. More, then lord chancellor. For some weeks Frith successfully evaded pursuit, but ultimately, in December, he fell into the hands of the authorities at Milton Shore in Essex, as he was on the point of making his escape to Flanders. The rigor of his imprisonment in the Tower was somewhat abated when Sir T. Audley succeeded to the chancellorship, and it was understood that both Cromwell and Cranmer were disposed to show great leniency.

Henry ordered that Frith should be examined; the result of a regular trial which followed was that he was found guilty of having denied, with regard to the doctrines of purgatory and of transubstantiation, that they were necessary articles of faith. On June 23, 1533, he was handed over to the secular arm, and at Smithfield on July 4th following he was burnt at the stake.

FRITHJOF'S SAGA, which was probably first written down at the end of the thirteenth or in the beginning of the fourteenth century, is an ancient Icelandic myth, which records the life and adventures of the hero Frithjof (properly *Fridhthjofr*—i. e., "peace-destroyer"), who loved the beautiful Ingeborg, the daughter of a petty king of Norway. Frithjof is supposed to have lived in the eighth century; but some writers assign to him a much earlier period.

FRITZLAR, a town formerly of Electoral Hesse and now of Prussia, at the head of a circle in the district of Cassel, on the left bank of the Eder, a left-hand tributary of the Weser. Population, 3,500.

FRIULI, a district at the head of the Adriatic, at present divided between Italy and Austria, the Italian portion being included in the province of Udine, and the Austrian comprising the countship of Görz and Gradiska, and the so-called Idrian district. It has a population of 700,000.

FROBEN, JOANNES (Latinized name *Frobenius*), a German printer and scholar, was born at Hammelburg in Franconia about 1460, and died in 1527.

FROBISHER, SIR MARTIN (*c.* 1535–94), English navigator and explorer, was born, it is usually stated, at Doncaster, but more probably at Altofts in the parish of Normanton, Yorkshire. Martin was sent to London to his mother's brother, Sir John York, and in 1554 went with a small fleet of merchant ships to Guinea under Admiral John Lock. We next hear of him in 1565 as Captain Martin Frobisher, and again in 1571 as superintending at Plymouth the building of a ship to be employed against the Irish. As early as 1560 or 1561 Frobisher had conceived the idea of discovering a north-west passage to Cathay, a short route to which was the motive of most of the Arctic voyages undertaken at that period and for long after. For years he schemed and plotted, and solicited in all quarters, from the court downward, to obtain means to carry his favorite project into execution; and it was only in 1576 that, mainly by help of the earl of Warwick, he was put in command of two tiny barks, the *Gabriel* and *Michael*, mere cockle shells of about twenty tons each, and a pinnace of ten tons, with an aggregate crew of thirty-five. On June 7th, Frobisher left Blackwall, and having received a good word from Queen Elizabeth at Greenwich, the expedition, if we may apply to it so considerable a term, sailed northward to the Shetland Islands. Stormy weather had been met with, in which the pinnace was lost, and sometime after the *Michael* deserted. After passing Greenland and being nearly wrecked, the *Gabriel* reached the coast of Labrador on July 28th. Some days later Hall's Island, at the mouth of Frobisher Bay, was reached, and a landing effected. Among the things hastily brought away by the men was some "black earth," which played an important part in connection with Frobisher's further career. Sailing up Frobisher Bay, then thought to be a strait, they reached Butcher's Island on August 18th. Here some natives were met with, and intercourse carried on with them for some days, the result being that five of Frobisher's men were decoyed and captured, and never more seen. After vainly trying to get back his men, Frobisher turned homeward, and reached London on October 9th. It seemed as if nothing more was to come of this expedition, when it was noised abroad that the appa-

rently valueless "black earth" was really a lump of gold ore.

It is difficult to say how this rumor arose, and whether there was any truth in it, or whether Frobisher was a party to a deception, in order to obtain means to carry out the great idea of his life. The story, at any rate, was so far successful; the greatest enthusiasm was manifested by the court and the commercial and speculating world of the time; and next year a much more important expedition than the former was fitted out, the queen lending Frobisher from the royal navy a ship of 200 tons. A Cathay company was established, with a charter from the crown, giving the company the sole right of sailing in every direction but the east; Frobisher was appointed high admiral of all lands and waters that might be discovered by him.

On May 26, 1577, the expedition, which, besides the royal ship, the *Aid* of 200 tons, consisted of the *Gabriel* and *Michael* of the previous year, with boats and pinnaces and an aggregate complement of 120 men, including miners, refiners, etc., left Blackwall, and sailing by the north of Scotland, arrived at Greenland early in July. Hall's Island was reached on the 18th, and though no more "black earth" was found there, abundance of it was found on other islands, and the ships well loaded with it. The country around, under the name of *Meta Incognita*, was solemnly taken possession of in the queen's name. Several weeks were spent in Frobisher Bay collecting ore, but very little was done in the way of discovery. There was much parleying and some skirmishing with the natives, and earnest but futile attempts made on the part of Frobisher to recover the men captured the previous year. The return was begun on August 22d, and the *Aid* reached Milford Haven on September 20th; the *Gabriel* and *Michael* having separated, arrived later at Bristol and Yarmouth. Frobisher was received and thanked by the queen at Windsor. Great preparations were made and considerable expense incurred for the assaying of the great quantity of "ore" brought home, in the testing of which the queen manifested a strong personal interest. This took up much time, and led to considerable dispute among the various parties interested. Meantime the faith of the queen and others remained strong in the productiveness of *Meta Incognita*, and it was resolved to send out a larger expedition than ever, with all necessities for the establishment of a colony of one hundred men. The queen herself contributed two ships of four hundred and two hundred tons, manned with one hundred and fifty men, and carrying one hundred and twenty pioneers. Besides these the fleet contained other thirteen vessels of various sizes, carrying other two hundred and fifty men, and the most elaborate and minute instructions were drawn up for the conduct of the expedition. Frobisher was again received by the queen at Greenwich, and her majesty threw a fine chain of gold around his neck. On May 31st the expedition left Harwich, and sailing by the English Channel, reached Greenland on June 10th. This time Frobisher and some of his men managed to land, "being the first known Christians that we have true notice of that ever set foot upon that ground." In the first days of July Frobisher Bay was reached, but stormy weather and dangerous ice drove the fleet southward, and unwittingly Frobisher entered what was afterward known as Hudson Strait, up which he sailed about sixty miles. When he found that he was sailing away from his destination, he, with apparent reluctance, turned back, and after many buffetings part of the fleet managed to come to anchor in Frobisher Bay. Some attempt was made at founding a settlement, and immense quantities of ore were shipped.

But, as might be expected, there was much dissension and not a little discontent among so heterogeneous a company, and on the last day of August the fleet set out on its return to England, which was reached in the beginning of October. Thus ended what was little better than a fiasco, though Frobisher himself cannot be held to blame for the result; the scheme was altogether chimerical, and the "ore" seems to have been not worth smelting. Between 1578 and 1585 we hear little of Frobisher, though he seems to have been doing service at various places, and steadily advancing in the good opinion of those in power. In 1580 he obtained the revision of the clerkship of the royal navy, of no immediate value. In 1585 he commanded in the *Primrose* in Sir F. Drake's expedition to the West Indies, in the large booty brought home from which he no doubt had a good share. For the next year or two he was employed in various responsible services against the designs of Spain, and in 1588 he did such excellent work in the *Triumph* against the Spanish Armada that he was rewarded with the honor of knighthood. He continued to cruise about in the Channel until 1589, when he was sent in command of a small fleet to the coast of Spain. In 1591 he visited his native Altofts, and there married a daughter of Lord Wentworth. He had prospered during recent years and was able to become a landed proprietor in Yorkshire and Notts. But he found little leisure for a country life, and was soon on the seas again watching and cutting off the richly laden ships of Spain. In November, 1594, he took part in the siege of Crozan, near Brest, and received a wound from which he died at Plymouth on November 22d.

FROEBEL, FRIEDRICH WILHELM AUGUST, philosopher, philanthropist, and educational reformer, was born at Oberweissbach, a village of the Thuringian Forest, on April 21, 1782. He completed his seventieth year, and died at Marienthal, near Bad-Liebenstein, on June 21, 1852. Like Comenius, with whom he had much in common, he was neglected in his youth, and the remembrance of his own early sufferings made him in after life the more eager in promoting the happiness of children. Left to himself in the Thuringian Forest, Froebel began to study nature, and without scientific instruction he obtained a profound insight into the uniformity and essential unity of nature's laws. No training could have been better suited to strengthen his inborn tendency to mysticism; and when he left the Forest at the early age of seventeen, he seems to have been possessed by the main ideas which influenced him all his life. The conception which in him dominated all others was the unity of nature; and he longed to study natural sciences that he might find in them various applications of nature's universal laws. With great difficulty he got leave to join his elder brother at the university of Jena, and there for a year he went from lecture-room to lecture-room hoping to grasp that connection of the sciences which had for him far more attraction than any particular science in itself. But Froebel's allowance of money was very small, and his skill in the management of money was never great, so his university career ended in an imprisonment of nine weeks for a debt of thirty shillings. He then returned home with very poor prospects, but much more intent on what he calls the course of "self-completion," than on "getting on" in a worldly point of view. He was soon sent to learn farming, but was recalled in consequence of the failing health of his father. In 1802 the father died, and Froebel, now twenty years old, had to shift for himself. It was some time before he found his true vocation, and for the next three and a half years we find him at work now in one part of Germany now in

another,—sometimes land-surveying, sometimes acting as accountant, sometimes as private secretary; but in all this his "outer life was far removed from his inner life," and in spite of his outward circumstances he became more and more conscious that a great task lay before him for the good of humanity. The nature of the task, however, was not clear to him, and it seemed determined by accident. While studying architecture in Frankfort-on-the-Main, he became acquainted with the director of a model school who had caught some of the enthusiasm of Pestalozzi. This friend saw that Froebel's true field was education, and he persuaded him to give up architecture and take a post in the model school. In this school Froebel worked for two years with remarkable success, but he then retired and undertook the education of three lads of one family. In this he could not satisfy himself, and he obtained the parents' consent to his taking the boys to Yverdon, near Neuchâtel, and there forming with them a part of the celebrated institution of Pestalozzi. Thus from 1807 till 1809 Froebel was drinking in Pestalozzianism at the fountain head, and qualifying himself to carry on the work which Pestalozzi had begun. For the science of education he had to deduce from Pestalozzi's experience principles which Pestalozzi himself could not deduce. And Froebel, the pupil of Pestalozzi, and a genius like his master, completed the reformer's system; taking the results at which Pestalozzi had arrived through the necessities of his position, Froebel developed the ideas involved in them, not by further experience but by deduction from the nature of man, and thus he attained to the conception of true human development and to the requirements of true education.

Holding that man and nature, inasmuch as they proceed from the same source, must be governed by the same laws, Froebel longed for more knowledge of natural science. He therefore determined to continue the university course which had been so rudely interrupted eleven years before, and in 1811, he began studying at Göttingen, whence he proceeded to Berlin. But again his studies were interrupted, this time by the king of Prussia's celebrated call "to my people." Though not a Prussian, Froebel was heart and soul a German. He therefore responded to the call, enlisted in Lützow's corps, and went through the campaign of 1813. But his military ardor did not take his mind off education. Froebel's soldiering showed him the value of discipline and united action, how the individual belongs not to himself but to the whole body, and how the whole body supports the individual.

Froebel was rewarded for his patriotism by the friendship of two men whose names will always be associated with his, Langenthal and Middendorff. These young men, ten years younger than Froebel, became attached to him in the field, and were ever afterward his devoted followers, sacrificing all their prospects in life for the sake of carrying out his ideas.

At the peace of Fontainebleau (signed in May, 1814,) Froebel returned to Berlin, and became curator of the museum of mineralogy under Professor Weiss. In accepting this appointment from the government he seemed to turn aside from his work as educator; but if not teaching he was learning. More and more the thought possessed him that the one thing needful for man was unity of development, perfect evolution in accordance with the laws of his being; such evolution as science discovers in the other organisms of nature. He at first intended to become a teacher of natural science, but before long wider views dawned upon him. Langenthal and Middendorff were in Berlin, engaged in tuition. Froebel gave them regular instructions in his theory, and at length, counting on their support, he

resolved to set about realizing his own idea of "the new education." This was in 1816. Three years before one of his brothers, a clergyman, had died of fever caught from the French prisoners. His widow was still living in the parsonage at Griesheim, a village on the Ilm. Froebel gave up his post, and set out for Griesheim on foot, spending his very last groschen on the way for bread. Here he undertook the education of his orphan niece and nephews, and also of two more nephews sent him by another brother. With these he opened a school and wrote to Middendorff and Langenthal to come and help in the experiment. Middendorff came at once, Langenthal a year or two later, when the school had been moved to Keilhau, another of the Thuringian villages, which became the Mecca of the new faith. In Keilhau Froebel, Langenthal, Middendorff, and Barop, a relation of Middendorff's, all married and formed an educational community. Such zeal could not be fruitless, and the school gradually increased, though for many years its teachers, with Froebel at their head, were in the greatest straits for money, and at times even for food. After fourteen years' experience he determined to start other institutions to work in connection with the parent institution at Keilhau, and being offered by a private friend the use of a castle on the Wartensee, in the canton of Lucerne, he left Keilhau under the direction of Barop, and with Langenthal he opened the Swiss institution. The ground, however, was very ill chosen. The Catholic clergy resisted what they considered as a Protestant invasion, and the experiment on the Wartensee and at Willisau in the same canton, to which the institution was moved in 1833, never had a fair chance. It was in vain that Middendorff at Froebel's call left his wife and family at Keilhau, and labored for four years in Switzerland without once seeing them. The Swiss institution never flourished. But the Swiss Government wished to turn to account the presence of the great educator; so young teachers were sent to Froebel for instruction, and finally Froebel moved to Burgdorf (a Bernese town of some importance, and famous from Pestalozzi's labors there thirty years earlier) to undertake the establishment of a public orphanage, and also to superintend a course of teaching for schoolmasters. The elementary teachers of the canton were to spend three months every alternate year at Burgdorf, and there compare experiences, and learn of distinguished men, such as Froebel and Bitzios. In his conferences with these teachers Froebel found that the schools suffered from the state of the raw material brought into them. Till the school age was reached the children were entirely neglected. Froebel's conception of harmonious development naturally led him to attach much importance to the earliest years, and his great work on *The Education of Man*, published as early as 1826, deals chiefly with the child up to the age of seven. At Burgdorf his thoughts were much occupied with the proper treatment of young children, and in scheming for them a graduated course of exercises, modeled on the games in which he observed them to be most interested. In his eagerness to carry out his new plans he grew impatient of official restraints; so he returned to Keilhau, and soon afterward opened the first *Kindergarten* or "Garden of Children," in the neighboring village of Blankenburg (1837). Firmly convinced of the importance of the Kindergarten for the whole human race, Froebel described his system in a weekly paper which appeared from the middle of 1837 till 1840. He also lectured in great towns; and he gave a regular course of instruction to young teachers at Blankenburg. But although the principles of the Kindergarten were gradually making their way, the first Kindergarten was failing for

want of funds. It had to be given up, and Froebel, now a widower (he had lost his wife in 1839), carried on his course for teachers first at Keilhau, and from 1848, for the last four years of his life, at or near Liebenstein, in the Thuringian Forest, and in the duchy of Meiningen. It is in these last years that the man Froebel will be best known to posterity, for in 1849 he attracted within the circle of his influence a woman of great intellectual power, the Baroness von Marenholtz-Bülow, who has given us in her *Recollections of Friedrich Froebel* the only lifelike portrait we possess.

In the great year of revolutions 1848, Froebel had hoped to turn to account the general eagerness for improvement, and Middendorff had presented an address on Kindergartens to the German Parliament. Besides this a nephew of Froebel's published books which were supposed to teach socialism. True, the uncle and nephew differed so widely that the "new Froebelians" were the enemies of "the old." The distinction was overlooked, and Friedrich and Karl Froebel were regarded as the united advocates of some new thing. In the reaction which soon set in Froebel found himself suspected of socialism and irreligion, and in 1851 the "cultus-minister" Raumer issued an edict forbidding the establishment of schools "after Friedrich and Karl Froebel's principles" in Prussia. This was a heavy blow to the old man, who looked to the government of the "*Cultus-staat*" Prussia for support, and was met with denunciation.

The prominence which Froebel gave to action, his doctrine that man is primarily a doer and even a creator, and that he learns only through "self-activity," may produce great changes in educational methods generally, and not simply in the treatment of children too young for schooling. But it was to the first stage of life that Froebel paid the greatest attention, and it is over this stage that his influence is gradually extending. Froebel held with Rousseau that each age has a completeness of its own, and that the perfection of the later stage can be attained only through the perfection of the earlier. If the infant is what he should be as an infant, and the child as a child, he will become what he should be as a boy, just as naturally as new shoots spring from the healthy plant. Every stage, then, must be cared for and tended in such a way that it may attain its own perfection. Impressed with the immense importance of the first stage, Froebel like Pestalozzi devoted himself to the instruction of mothers. But he would not, like Pestalozzi, leave the children entirely in the mother's hands. Pestalozzi held that the child belonged to the family; Fichte, on the other hand, claimed it for society and the state. Froebel, whose mind, like that of Frederick Maurice, delighted in harmonizing apparent contradictions, and who taught that "all progress lay through opposites to their reconciliation," maintained that the child belonged both to the family and to society, and he would therefore have children spend some hours of the day in a common life and in well-organized common employments. These assemblies of children he would not call schools, for the children in them ought not be old enough for schooling. So he invented the name *Kindergarten*, garden of children, and called the superintendents "children's gardeners." He laid great stress on every child cultivating its own plot of ground, but this was not his reason for the choice of the name. It was rather that he thought of these institutions as inclosures in which young human plants are nurtured. In the Kindergarten the children's employment should be play. But any occupation in which children delight is play to them; and Froebel invented a series of employments, which, while they are in this sense play to the children, have nevertheless, as seen from the adult point of view,

a distinct educational object. This object, as Froebel himself describes it, is "to give the children employment in agreement with their whole nature, to strengthen their bodies, to exercise their senses, to engage their awakening mind, and through their senses to bring them acquainted with nature and their fellow creatures; it is especially to guide aright the heart and the affections, and to lead them to the original ground of all life, to unity with themselves."

At the end of nearly forty years since Friedrich Froebel's death, the spread of his ideas, or at least of his methods, seems rapidly extending. Prophets are slowly recognized in their own country, and although he is so thoroughly German in his mode of thought and exposition that, as Deinhardt says, no other nation could have produced such a man, the Germans as yet are not so ready to learn from Froebel as from the Swiss Pestalozzi. In Austria the Kindergarten has made more way than in Prussia, and it prospers in America. But Froebel's influence is not limited to the Kindergarten. His conception of education cannot but affect the thoughts, and ultimately the practice, of all teachers who will be at the pains to understand it.

FROG, the common name of an extensive group of Batrachians forming, along with the toads, the amphibian order *Anoura*. They are divided into nine families, containing ninety-two genera and four hundred and forty species, and are found in all quarters of the globe, being most abundant in the tropical and sub-tropical regions, but also occurring within the arctic circle. Most of the families have a very limited distribution, and only two of them, the true frogs (*Ranidae*), of which there are 150 species, and the *Polypodidae*, a family of tree-frogs, containing 124 species, can be regarded as almost cosmopolitan. The neotropical, or South American region, is richest in peculiar forms, while it possesses some only found beyond it in the widely remote Australian region; thus the *Polypodidae*, a family of tree-frogs, is peculiar to the two; the genus *Litoria* is confined to Australia, with the exception of a single species occurring in Paraguay; while the only frog known in New Zealand has its nearest allies in South America. Those regions bear also a negative resemblance in the total absence from both of the genus *Rana*, the sixty species of which are distributed throughout the other quarters of the globe. These facts, among others, have been adduced in support of the theory that at one time the continents of South America and Australia had a land connection. Frogs are almost totally absent from oceanic islands, a single species occurring in New Zealand, and one or two others in the Pacific islands, as far east as the Fijis, beyond which they are unknown. On the assumption that those islands obtained their present fauna from the nearest continental land, the absence of frogs can be readily explained by the fact that salt water is alike fatal to the adult frog and to its spawn, and thus formed an insuperable barrier to their migration.

Frogs, as is shown by their wide distribution, are capable of enduring a considerable degree of both heat and cold; they are, however, altogether intolerant of long-continued drought, a desert forming as certain a barrier to their migration as an ocean. Both during their larval stage and afterward, for the purpose of cutaneous respiration, abundant moisture is a necessity of their existence; consequently, whether they live on the ground or on trees, they are never found far from rivers, marshes or lakes. In winter the frogs of northern climates hibernate, burying themselves in the mud at the bottom of pools, and lying clustered together in a state of complete torpidity. In hot climates they are said to go into a similar condition, known as "estivation," during periods of exceptional heat and drought, in order

to retard the dissipation of the moisture in their bodies. On reappearing from their long winter sleep, the work of reproduction is at once entered upon, the males making their presence known to the females by the vigorous exercise of their vocal organs. The croaking of the common frog can only be regarded as pleasant from its association with the welcome advent of spring; still more unpleasant, however, is the much louder croak of the edible frog of the continent.

FROHLICH, ABRAHAM EMANUEL, a German-Swiss poet, was born 1796, at Brugg, in the canton of Aargau, where his father was a teacher. At the age of fifteen he was sent to study theology in the academy of Zürich. In 1817 he was ordained, and returned as teacher to his native town, where he lived for ten years. He was then appointed professor of German language and literature in the canton-school at Aarau, which post he lost, however, in the political quarrels of 1830. He afterward obtained the post of teacher and rector of the Bezirksschule, and was also appointed Hülfsprediger. He died 1865. Fröhlich is best known for his two heroic poems, *Ulrich Zwingli* and *Ulrich von Hutten*, and especially for his fables, which have been ranked with those of Hagedorn, Lessing, and Gellert.

FROISSART, JEAN (1337-1410?). The personal history of Froissart, the circumstances of his birth and education, the incidents of his life, must all be sought in his own verses and chronicles. He possessed in his own lifetime no such fame as that which attended the steps of Petrarch; when he died it did not occur to his successors that a chapter might well be added to his *Chronicle* setting forth what manner of man he was who wrote it. The village of Lestines, where he was curé, has long forgotten that a great writer ever lived there. They cannot point to any house in Valenciennes as the lodging in which he put together his notes and made history out of personal reminiscences. It is not certain when or where he died, or where he was buried. It is fortunate, therefore, that the scattered statements in his writings may be so pieced together as to afford a tolerably connected history of his life year after year. The personality of the man, independently of his adventures, may be arrived at by the same process. It will be found that Froissart, without meaning it, has portrayed himself in clear and well-defined outline.

The date generally adopted for his birth is 1337. In after years Froissart pleased himself by recalling in verse the scenes and pursuits of his childhood. These are presented in vague generalities. There is nothing to show that he was unlike any other boy, and, unfortunately, it did not occur to him that a photograph of a schoolboy's life amid bourgeois surroundings would be to posterity quite as interesting as that faithful portraiture of courts and knights which he has drawn up in his *Chronicle*. In any case he was born in a place, as well as at a time, singularly adapted to fill the brain of an imaginative boy. Valenciennes, at the present day a dull town, was then a city extremely rich in romantic associations. The castle of Valenciennes was illustrious in the romance of *Perceforest*: there was born that most glorious and most luckless hero, Baldwin, first emperor of Constantinople. All the splendor of mediæval life was to be seen in Froissart's native city; on the walls of the Salle le Comte glittered—perhaps painted by his father—the arms and scutcheons beneath the banners and helmets of Luxembourg, Hainault, and Avesnes; the streets were crowded with knights and soldiers, priests, artisans, and merchants; the churches were rich with stained glass, delicate tracery, and precious carving; there were libraries full of richly illuminated manuscripts on which the boy could gaze with delight; every year there was the *fête* of the *py*

d'Amour de Valenciennes, at which he would hear the verses of the competing poets; there were festivals, masques, mummeries, and moralities. The eyes of the boy were turned upon the castle and not upon the town; it was the splendor of the knights which dazzled him, inasmuch that he regarded and continued ever afterward to regard a prince gallant in the field, glittering of apparel, lavish of largesse, as almost a god.

The moon, he says, rules the first four years of life; Mercury the next ten; Venus follows. He was fourteen when the last goddess appeared to him in person, as he tells us, after the manner of his time, and informed him that he was to love a lady, "belle, jone, et gente." Awaiting this happy event, he began to consider how best to earn his livelihood. They first placed him in some commercial position—impossible now to say of what kind—which he simply calls "la marchandise." He very soon abandoned it and resolved on becoming a learned clerk. He then naturally began to make verses, like every other learned clerk. Quite as naturally, and still in the character of a learned clerk, he fulfilled the prophecy of Venus, and fell in love. He found one day a demoiselle reading a book of romances. He did not know who she was, but stealing gently toward her, he asked her what book she was reading. It was the romance of *Cleomades*. He remarks the singular beauty of her blue eyes and fair hair, while she reads a page or two, and then he was at once provided with that essential for soldier, knight, or poet, a mistress—one for whom he could write verses. She was rich and he was poor; she was nobly born and he obscure; it was long before she would accept the devotion, even of the conventional kind which Froissart offered her, and which would in no way interfere with the practical business of her life. And in this hopeless way, the passion of the young poet remaining the same, and the coldness of the lady being unaltered, the course of this passion ran on for some time. Nor was it until the day of Froissart's departure from his native town that she gave him an interview and spoke kindly to him, even promising, with tears in her eyes, that "Doulce Pensée" would assure him that she would have no joyous day until she should see him again.

He was eighteen years of age, he had learned all that he wanted to learn; he possessed the mechanical art of verse; he had read the slender stock of classical literature accessible; he longed to see the world. He must already have acquired some distinction, because, on setting out for the court of England, he was able to take with him letters of recommendation from the king of Bohemia and the count of Hainault to Queen Philippa, niece of the latter. He was well received by the queen, always ready to welcome her own countrymen; he wrote ballads and virelays for her and her ladies. But after a year he began to pine for another sight of "la très douce, simple, et quoie," whom he loved loyally. Good Queen Philippa, perceiving his altered looks and guessing the cause, made him confess that he was in love and longed to see his mistress. She gave him his *congé* on the condition that he was to return. It is clear that the young clerk had already learned to ingratiate himself with princes.

The conclusion of his single love adventure is simply and unaffectedly told in his *Trettie de l'Espinette Amoureuse*. It was a passion conducted on the well-known lines of conventional love; the pair exchanged violets and roses, the lady accepted ballads; Froissart became either openly or in secret her recognized lover, a mere title of honor, which conferred distinction on her who bestowed it, as well as upon him who received it. But the progress of the amour was rudely interrupted by the arts of "Malebouche," or Calumny. The story, what-

ever it was, that Malebouche whispered in the ear of the lady, led to a complete rupture. The *damoiselle* not only scornfully refused to speak to her lover or acknowledge him, but even seized him by the hair and pulled out a handful. Nor would she ever be reconciled to him again. Years afterward, when Froissart writes the story of his one love passage, he shows that he still takes delight in the remembrance of her, loves to draw her portrait, and lingers with fondness over the thought of what she once was to him.

Perhaps to get healed of his sorrow, Froissart began those wanderings in which the best part of his life was to be consumed. He first visited Avignon, perhaps to ask for a benefice, perhaps as the bearer of a message from the bishop of Cambrai to pope or cardinal. It was in the year 1360, and in the pontificate of Innocent VI. From the papal city he seems to have gone to Paris, perhaps charged with a diplomatic mission. In 1361 he returned to England after an absence of five years. The queen made young Froissart one of her secretaries, and he began to serve her with "*beaux ditties et traités amoureux*."

Froissart would probably have been content to go on living at ease in this congenial atmosphere of flattery, praise, and caresses, pouring out his *relays* and *chansons* according to demand with facile monotony, but for the instigation of Queen Philippa, who seems to have suggested to him the propriety of traveling in order to get information for more rhymed chronicles. It was at her charges that Froissart made his first serious journey. He seems to have traveled a great part of the way alone, or accompanied only by his servants, for he was fain to beguile the journey by composing an imaginary conversation in verse between his horse and his hound. This may be found among his published poems, but it does not repay perusal. In Scotland he met with a favorable reception, not only from King David but from William of Douglas, and from the earls of Fife, Mar, March and others. The souvenirs of this journey are found scattered about in the chronicles. His travels in Scotland lasted six months. Returning southward he rode along the whole course of the Roman wall, a thing alone sufficient to show that he possessed the true spirit of an archaeologist; he thought that Carlisle was Carlion, and congratulated himself on having found King Arthur's capital; he calls Westmoreland, where the common people still spoke the ancient British tongue, North Wales; he rode down the banks of the Severn, and returned to London by way of Oxford.

In London Froissart entered into the service of King John of France as secretary, and grew daily more courtly, more in favor with princes and great ladies. He probably acquired at this period that art, in which he has probably never been surpassed, of making people tell him all they knew. No newspaper correspondent, no American interviewer, has ever equaled this mediæval collector of intelligence. From Queen Philippa, who confided to him the tender story of her youthful and lasting love for her great husband, down to the simplest knight—Froissart conversed with none beneath the rank of gentlemen—all united in telling this man what he wanted to know. He wanted to know everything; he liked the story of a battle from both sides and from many points of view; he wanted the details of every little cavalry skirmish, every capture of a castle, every gallant action and brave deed. And, what was more remarkable, he forgot nothing.

While he was on a tour through Italy he received at Rome the news of the death of his patron, Queen Philippa.

Philippa dead, Froissart looked around for a new

patron. Then he hastened back to his own country and presented himself, with a new book in French, to the duchess of Brabant. Froissart may also have found a patron in Yolande de Bar, grandmother of King René of Anjou. In any case he received a substantial gift from some one in the shape of the benefice of Lestines, a village some three or four miles from the town of Binche. Also, in addition to his cure, he got placed upon the duke of Brabant's pension list, and was entitled to a yearly grant of grain and wine, with some small sum in money.

It is clear, from Froissart's own account of himself, that he was by no means a man who would at the age of four or five and thirty be contented to sit down at ease to discharge the duties of parish priest, to say mass, to bury the dead, to marry the villagers, and to baptize the young. In these days, and in that country, it does not seem that other duties were expected. Preaching was not required, godliness of life, piety, good works, and the graces of a modern ecclesiastic were not looked for. Therefore, when Froissart complains to himself that the taverns of Lestines got 500 francs of his money, we need not at once set him down as either a bad priest, or exceptionally given to drink. The people of the place were greatly addicted to wine; the *taverniers de Lestines* proverbially sold good wine and the Flemings were proverbially of a joyous disposition. Froissart, the parish priest of courtly manners, no doubt drank with the rest, and listened if they sang his own, not the coarse country songs. And then came Gui de Blois, one of King John's hostages in London in the old days. He had been fighting in Prussia with the Teutonic knights, and now, a little tired of war, proposed to settle down for a time in his castle of Beaumont. This prince was a member of the great house of Chatillon. He was count of Blois, of Soissons, and of Chimay. He had now, about the year 1374, an excellent reputation as a good captain. In him Froissart, who hastened to resume acquaintance, found a new patron. More than that, it was this sire de Beaumont, in emulation of his grandfather, the patron of Jean le Bel, who advised Froissart seriously to take in hand the history of his own time. Froissart was then in his thirty-sixth year. For twenty years he had been rhyming, for eighteen he had been making verses for queens and ladies. Yet during all this time he had been accumulating in his retentive brain the materials for his future work.

He began by editing, so to speak, that is, by rewriting with additions the work of Jean le Bel; Gui de Blois, among others, supplied him with additional information. His own notes, taken from information obtained in his travels, gave him more details, and when in 1374 Gui married Marie de Namur, Froissart found in the bride's father, Robert de Namur, one who had himself largely shared in the events which he had to relate. He, for instance, is the authority for the story of the siege of Calais and the six burgesses. Provided with these materials, Froissart remained at Lestines, or at Beaumont, arranging and writing his chronicles. During this period, too, he composed his *Espinette Amoureux*, and the *Joli Buisson de Jونسce*, and his romance of *Méliador*. He also became chaplain to the count of Blois, and obtained a canonry of Chimay. After this appointment we hear nothing more of Lestines, which he probably resigned.

In these quiet pursuits he passed twelve years, years of which we hear nothing, probably because there was nothing to tell. In 1386 his travels began again, when he accompanied Gui to his castle at Blois, in order to celebrate the marriage of his son Louis de Dunois with Marie de Berry. He wrote a *pastourelle* in honor of

the event. Then he attached himself for a few days to the duke of Berry, from whom he learned certain particulars of current events, and then becoming aware of what promised to be the most mighty feat of arms of his time, he hastened to Sluys in order to be on the spot. At this port the French were collecting an enormous fleet, and making preparations of the greatest magnitude in order to repeat the invasion of William the Conqueror. They were tired of being invaded by the English, and wished to turn the tables. The talk was all of conquering the country and dividing it among the knights, as had been done by the Normans. It is not clear whether Froissart intended to go over with the invaders; but as his sympathies are ever with the side where he happens to be, he exhausts himself in admiration of this grand gathering of ships and men. But the delays of the duke of Berry, and the arrival of bad weather, spoiled everything. There was no invasion of England. In Flanders Froissart met many knights who had fought at Rosebeque, and could tell him of the troubles which in a few years desolated the country, once so prosperous. He set himself to ascertain the history with as much accuracy as the comparison of various accounts by eye witnesses and actors would allow. He stayed at Ghent, among those ruined merchants and mechanics, for whom, as one of the same class, he felt a sympathy never extended to English or French, perhaps quite as unfortunate; and he devotes no fewer than 300 chapters to the Flemish troubles, an amount out of all proportion to the comparative importance of the events. This portion of the chronicle was written at Valenciennes.

This part of his work finished, he considered what to do next. There was small chance of anything important happening in Picardy or Hainault, and he determined on making a journey to the south of France in order to learn something new.

On this occasion he rode first to Blois; on the way he fell in with two knights who told him of the disasters of the English army in Spain; one of them also informed him of the splendid hospitalities and generosity of Gaston Phœbus, count of Foix, on hearing of which, Froissart resolved to seek him out. He avoided the English provinces of Poitou and Guienne, and rode southward through Berry, Auvergne and Languedoc. Arrived at Foix, he discovered that the count was at Orthez, whither he proceeded in company with a knight named Espaing de Lyon, who, Froissart found, had not only fought but could describe. Arrived at length at Orthez, Froissart lost no time in presenting his credentials to the count of Foix. Mindful, no doubt, of those paid clerks who were always writing verses, Froissart introduced himself as a chronicler. He could, of course, rhyme, and in proof he brought with him his romance of *Meliador*; but he did not present himself as a wandering poet. The count received him graciously, and speedily discovered the good qualities of his guest.

Leaving Gaston at length, Froissart assisted at the wedding of the old duke of Berry with the youthful Jeanne de Bourbon, and was present at the grand reception given to Isabeau of Bavaria by the Parisians. He then returned to Valenciennes, and sat down to write his fourth book. He next made his last visit to England, where, after forty years' absence, he naturally found no one who remembered him. Here he gave King Richard a copy of his "traités amoureux," and got favor at court. He stayed in England some months, seeking information on all points from his friends, Henry Chrystead and Richard Stury, from the dukes of York and Gloucester, and from Robert the Hermit. The rest is vague tradition. He is said to have died at Chimay; it is further said that he died in poverty so

great that his relations could not even afford to carve his name upon the headstone of his tomb.

FROME, a parliamentary borough and market town of Somersetshire, is situated on the small river Frome, an affluent of the Avon, eleven miles south of Bath.

FROMENTIN, EUGENE (1826-76), French painter, was born at La Rochelle. His works are distinguished by striking composition, great dexterity of handling, and brilliancy of color. In them is given with great truth and refinement the unconscious grandeur of barbarian and animal attitudes and gestures. He died at La Rochelle.

FROND, in botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined, and was applied to the leaves of palus, etc. The term *leaf* is now very generally used, even as to mosses, ferns, etc., and the term *thallus* is employed as to lichens. In the case of many *Algae*, the term frond is often used to designate the whole plant, except its organs of reproduction.

FRONDE, WAR OF THE (1648-52). See CONDE.

FRONTINUS, SEXTUS JULIUS, a Roman soldier, and the author of some interesting works, was born of a patrician family at Rome, about 40 A.D. Nothing is known of his early life or history till we find him acting as *prætor urbanus*, under Vespasian, in 70, an office from which he soon retired to make way for Domitian. Five years later he was sent into Britain to succeed Petilius Cerealis as governor of that island. He subdued the Silures, and held the other native tribes in check till 78, when he was succeeded by Agricola. In 79 he was appointed *curator aquarum* at Rome, an office which was never conferred except upon persons of very high standing. He was also a member of the college of augurs, retaining the dignity till his death, which appears to have happened about 103.

FRONTO, MARCUS CORNELIUS, a Roman grammarian, rhetorician and advocate, was born of an Italian family at Cirta, in Numidia, a Libyan of the Libyans, as he calls himself. The date of his birth is unknown, but as he was quaestor in 138, it must have been before 113, and not improbably between 100 and 110. He came to Rome in the reign of Hadrian, and soon gained such renown as an advocate and orator as to be reckoned inferior only to Cicero.

FROSINONE, a town of Italy, in the province of Rome, on the railway between Rome and Naples, about sixty-two miles from the former and 104 from the latter.

FROST, WILLIAM EDWARD (1810-77), a painter of mythological and fanciful subjects, was born at Wandswoth, near London.

FROSTBITE. See MORTIFICATION.

FROSTBURG, a growing Maryland town, situated in Alleghany county. It has railroad, banking and telegraph facilities, and a population (1900) of 5,274.

FRUGONI, CARLO INNOCENZO (1692-1768), an Italian poet, was born at Genoa. Frugoni holds a place in the first rank of the lyrical poets of his time, and his other compositions, which embrace almost every form of poetry, have in most cases considerable merit, and are generally characterized by harmony of versification, elegance of language, and appositeness and great variety of imagery.

FRUIT (*fructus*), in the botanical use of the term, in phanerogamous plants, is a mature ovary containing a seed or seeds; and in cryptogamous plants, a spore-case (*sporangium* or *theca*) containing spores. Other parts of the flower, most frequently the calyx, sometimes remain after flowering is over, undergo a further development, become incorporated with the ovary, and form

part of the fruit. The development of the fruit in phanerogamous plants depends upon the fertilization of the ovules. For the various forms of fruits, see Balfour's or Henfrey's *Manual of Botany*; and for classification see Dickson's *Journal of Botany*, October, 1871. All that is external to the proper integuments of the seed in the ripe fruit is called the *pericarp*; and this, which varies extremely in size and other characters, usually consists of three layers, the outermost of which is called the *epicarp*; the middle one, the *mesocarp*, or sometimes the *sarcocarp*; and the innermost, the *endocarp*. A classification of the different kinds of fruits is extremely difficult, although they afford characters of great importance in descriptive and systematic botany. A convenient primary division of fruits is into those which are formed from one flower, and those which are formed by incorporation of the ovaries of many flowers. The production of ripe fruit is exhaustive to the energies of a plant, and plants ordinarily annual may be preserved in life for several years by preventing it. Very young fruit trees generally fail to bring fruit to perfection, and the first flowers of melons and gourds are often, for a similar reason, abortive; while, on the contrary, any circumstance that favors an accumulation of sap in a particular season tends to render fruit trees unusually productive in the next, as when the whole blossoms of a year are killed by frost, or when, from the coldness of the previous summer, flower-buds have not been formed in abundance. The value of fruits to man sometimes, as in the corn plants, chiefly depends on the farinaceous matter of their seeds, containing starch, gluten, etc.; sometimes, as in the banana and bread-fruit, on the starchy matter of the pulpy part; sometimes, as in nuts, on fixed oils; sometimes, as in many succulent fruits, on sugar and various acids, with gum, pectine, etc., and for peculiar principles capable of application to medicinal and other uses, or making them capable of being used as condiments, perfumes, etc. Coffee, cocoa, pepper, vanilla, and many other articles of commerce are obtained from fruits.

FRUMENTIUS, an early Christian missionary and bishop, who is recognized by the Abyssinian church as its apostle and founder, and usually bears in Abyssinian literature the title of Abba Salama, or Father of Salvation. He was consecrated bishop by Athanasius of Alexandria in 326 A.D., and returned to propagate Christianity among the natives.

FRUMENTY, or FURMETY (Lat. *frumentum*, "wheat"), an English dish made of whole wheat or rice boiled in milk and seasoned.

FRUNDSBERG, GEORG VON, the great leader of the German landsknechte during the Italian wars of the emperors Maximilian and Charles V., was born in 1473 at Mindelheim in Swabia, and there he died in 1528. He fought in twenty pitched battles, besides sieges and skirmishes without number; and the victory of Pavia (1525) was largely due to him. Two years later he was marching on Rome with the Constable de Bourbon, when a mutiny of his soldiers brought on a stroke of apoplexy. See monographs by Barthold (1833), and Heilmann (1868).

FRUSTUM, in geometry, is the part of a solid next the base, left on cutting off the top by a plane parallel to the base. The frustrum of a sphere or spheroid, however, is any part of these solids comprised between two circular sections; and the *middle* frustrum of a sphere is that whose ends are equal circles, having the center of the sphere in the middle of it, and equally distant from both ends.

FRUYTIERS, PHILIP, a pupil of the Jesuits' college at Antwerp in 1627, entered the Antwerp guild of painters, without a fee, in 1631. He is described in the

register of that institution as "illuminator, painter and engraver." Unhappily no undoubted production of his hand has been preserved, and hence we are at a loss to surely gauge his acquirements. He died in 1666.

FRY, or GURNEY, ELIZABETH (1780–1845), an eminent philanthropist, and, after Howard, the chief promoter of prison reform in Europe, was born in Norwich. In August, 1800, she became the wife of Joseph Fry, a London merchant. Although she had made several visits to Newgate prison as early as February, 1813, it was not until nearly four years afterward that the great public work of her life may be said to have begun. The "Association for the Improvement of the Female Prisoners in Newgate," was formed in April, 1817. Its aim was the much-needed establishment of some of what are now regarded as the first principles of prison-discipline, such as entire separation of the sexes, classification of criminals, female supervision for the women, and adequate provision for their religious and secular instruction, as also for their useful employment. The ameliorations effected by this association, and largely by the personal exertions of Mrs. Fry, soon became obvious, and led to a rapid extension of similar methods to other places. In 1842, through failing health, Mrs. Fry was compelled to forego her plans for a still more widely extended activity, but had the satisfaction of hearing from almost every quarter of Europe that the authorities were giving increased practical effect to her suggestions. In 1844 she was seized with a lingering illness of which she died on October 12, 1845. She was survived by a numerous family, the youngest of whom was born in 1822.

FUAD PASHA, MEHMED (1814–1869), a Turkish statesman and author, was born at Constantinople. In 1867 he accompanied the sultan to England and France. He died at Nice, whither he had gone for the benefit of his health. Fuad Pasha was one of the first members of the Turkish Imperial Academy of Sciences and Belles-lettres, founded in 1851. He is the author of a poem entitled *Ahambra*, written after his sojourn in Spain, and of a Turkish grammar. The suave and genial manners of Fuad Pasha, and his diplomatic talents, stood Turkey in good stead in connection with the Crimean war and the various negotiations in reference to Turkey's relation to her Christian subjects, and helped to inspire a faith in her capacity for reforms, which later events have shown to have been largely misplaced. He endeavored to secure to his country the material advantages to be derived from the adoption of European improvements, but his measures effected no lasting reform in her administration; and by the adoption of a heedless system of credit, he largely increased her financial difficulties.

FUCHS, JOHANN JOSEPH. See FUX.

FUCHS, JOHANN NEPOMUK VON, an eminent chemist and mineralogist, was born at Mattenzell, near Bremberg, in the neighborhood of the Baierischer Wald, May 15, 1774. Having acquired a knowledge of medicine at Vienna and Heidelberg, he in 1801 turned his attention to chemistry and mineralogy, which he studied at Freiberg, Berlin and Paris. Mineralogy and inorganic chemistry are indebted to Fuchs for numerous researches. He is more especially known for his discovery, in 1823, of a process for making a soluble glass, used for fixing fresco colors, according to the method termed stereochromy.

FUCHS, LEONHARD (1501–1566), a celebrated German physician, and one of the fathers of scientific botany, was born at Wemdingen in Bavaria.

FUCHSIA, so named by Plumier in honor of the botanist Leonhard Fuchs, a genus of plants of the natural order *Onagraceae*, characterized by entire, usually

opposite leaves; pendant flowers; a funnel-shaped, brightly colored, quadripartite, deciduous calyx; four petals, alternating with the calycine segments; eight, rarely ten, exserted stamens; a long and filiform style, and inferior ovary; and fleshy, ovoid, many-seeded berries or fruit. All the members of the genus, with the exception of the New Zealand species, are natives of Central and South America—occurring in the interior of forests, or in damp and shady mountainous situations. The various species differ not a little in size as well as in other characters; some being dwarf shrubs; others, as *F. aborescens* and *F. apetala*, attaining a height of twelve to sixteen feet, and having stems several inches in diameter.

FUEL. This term includes all substances that may be usefully employed for the production of heat by combustion with atmospheric air or oxygen. Any element or combination of elements susceptible of oxidation, *i.e.*, any substance electro-positive to oxygen, may under particular conditions be made to burn; but only those that ignite by a moderate preliminary heating, and burn with comparative rapidity, and, what is practically of equal importance, are obtainable in quantity and at a moderate price, come fairly within the category of fuels. Among elementary substances only hydrogen, sulphur, carbon, silicon and phosphorus can be so classed, and of these the last two are only of special application. More important than the elements are, however, the carbohydrates, or compounds of carbon, hydrogen and oxygen, which form the bulk of the natural fuels, wood, peat and coal, as well as of their liquid and gaseous derivatives, coal gas, coal tar, pitch, oil, etc., which are possessed of great fuel value. Carbon in the elementary form has its nearest representatives in charcoal and coke.

FUENTE DE CANTOS, a town of Spain in the province of Badajoz, and midway between the cities of Badajoz and Seville.

FUENTE DEL MAESTRE, a town of Spain in the province of Badajoz, about twenty-five miles south-southwest of Merida.

FUENTERRABIA, an ancient town and frontier fortress of Spain, in the province of Guipúzcoa and bishopric of Pamplona.

FUERO. The Castilian use of this Latin word (forum) in the sense of a right, privilege, or charter is most probably to be traced to the Roman conventus juridici, otherwise known as jurisdictions, or fora, which in Pliny's time were already numerous in the Iberian peninsula. In each of these provincial fora the Roman magistrate, as is well known, was accustomed to pay all possible deference to the previously established common law of the district; and it was the privilege of every free subject to demand that he should be judged in accordance with the customs and usages of his proper forum. This was especially true in the case of the inhabitants of those towns which were in possession of the *jus italicum*. It is not, indeed, demonstrable, but there are many presumptions, besides some fragments of direct evidence, which make it more than probable, that the old administrative arrangements both of the provinces and of the towns, but especially of the latter, remained practically undisturbed at the period of the Gothic occupation of Spain.

FUGGER, the name of a Swabian family which, by remarkable energy in industry and commerce, acquired enormous wealth, and rose to high rank in the state. The founder of the family was John Fugger, a respectable master weaver at Graben, near Augsburg. His eldest son, John, associated trade in linen with weaving in Augsburg, of which he became a citizen by marriage in 1370. Here he rose to an honorable position,

being one of the twelve councilors of the guild of weavers, and an assessor of the Felmgericht, the much dreaded secret tribunal of Westphalia. He died in 1409, leaving a fortune of 3,000 florins. From that date to the present time members of the family have occupied positions of trust, at various intervals furnishing the sinews of war for their sovereigns and receiving therefor honors and privileges which have raised them to their present station.

FUH-CHOW, more usually **FOO-CHOW**, a city of China, capital of the province of Fuh-keen, and one of the principal ports open to foreign commerce. In the local dialect it is called Hokchin. It is situated on the river Min, about thirty-five miles from the sea, one hundred and forty miles north of Amoy and two hundred and eighty south of Hang-Chow. The city proper, lying nearly three miles from the north bank of the river, is surrounded by a wall about thirty feet high and twelve feet thick, which makes a circuit of upward of five miles, and is pierced by seven gateways surrounded by tall fantastic watch-towers. The most remarkable establishment of Fuh-Chow is the arsenal situated about three miles down the stream at Pagoda Island, where the sea-going vessels usually anchor. It was founded in 1867, and is conducted under the direction of French engineers according to European methods. The port was opened to European commerce in 1842; and in 1853 the firm of Russell & Co. shipped the first cargoes of tea from Fuh-Chow to Europe and America. A large trade is carried on by the native merchants in timber, paper, woolen and cotton goods, oranges and olives; but the foreign houses mainly confine themselves to opium and tea. The population of Fuh-Chow is stated (1900) at 650,000.

FÜHRICH, **JOSEPH VON**, a painter and contemporary of Cornelius and Overbeck, was born at Kratzau, in Bohemia, in 1800. Führich's fame extended far beyond the walls of the Austrian capital; and there are few in Germany who are not acquainted with his illustrations to Tieck's *Genosfeva*, the Lord's Prayer, the Triumph of Christ, the Road to Bethlehem, the Succession of Christ according to Thomas à Kempis, the Prodigal Son, and the verses of the Psalter. He died on March 13, 1876.

FULDA. The monastery of Fulda occupies the place in the ecclesiastical history of mid Germany, which Monte Cassino holds in Italy, St. Galle in south Germany, Corvey in north Germany, Tours in France, and Iona in Scotland. It was the center of a missionary work, both of conversion and reformation, organized on monastic principles. The monastery of Fulda was only one of several founded by Boniface, the so-called "apostle of Germany," but it was specially favored by its founder, who selected it for his burying place, and it was by far the most important. Fulda became the parent of many other missionary monasteries, the most famous of these being Hirsgau in Swabia. In 968 the abbot of Fulda was recognized as primate of the other abbeys of Germany; but wealth and power brought corruption. In the beginning of the eleventh century, the monastery had to be reformed, and this was done by turning out the old monks, bringing a number of new ones from Scotland, and reestablishing in all its strictness the old Benedictine rule.

FULHAM, a suburb of London, in the county of Middlesex, is situated on the Thames, five and one-half miles southwest of St. Paul's, and opposite Putney, with which it is connected by a curious old wooden bridge erected in 1729.

FULLER, **ANDREW** (1754-1815), a distinguished preacher and theological writer of the Baptist denomination, was born at Wicken, in Cambridgeshire.

FULLER, SARAH MARGARET. See OSSOLI.

FULLER, THOMAS, the witty divine and historian, eldest son of a father of the same name who was rector of Aldwinkle St. Peter's, Northamptonshire, was born at the rectory house of that country parish in the year 1608. At an early age he was admitted to Queen's College, Cambridge, then presided over by Dr. John Davenant. He was apt and quick in study; and in Lent 1624-5 he became B.A., and in July, 1628, M.A. In 1630 he received from Corpus Christi College, in the same university, the curacy of St. Benet's, which he held for a short time, and where he had for a parishioner the celebrated carrier Hobson. Fuller's quaint and humorous oratory, as displayed in his sermons on Ruth, soon attracted attention. His first published volume of sermons appeared in 1640 under the title of *Joseph's parti-colored Coat*, quarto, which contains many of his quaint utterances and odd conceits. His grosser mannerisms of style, derived from the divines of the former generation, disappeared for the most part in his subsequent discourses.

A sermon preached on church reformation, satirizing the religious reformers, and maintaining that only the Supreme Power could initiate reforms, aroused a storm in the metropolis, then well-nigh abandoned by the active royalists, and brought about Fuller's secret flight to Oxford, and the loss of all his preferences and property. He lived in a hired chamber at Lincoln College for seventeen weeks. Thence he put forth a witty and effective reply to John Saltmarsh, who had attacked his views on ecclesiastical reform. Fuller subsequently published, by royal request, a fast sermon preached May 10, 1644, at St. Mary's, Oxford, before the king and prince Charles, called *Jacob's Vow*. In this discourse, which, it is supposed, had relation to the king's proposed restoration of the church lands, the preacher referred to some religious exercise then being observed every Tuesday by Charles I., all record of which has been omitted in the pages of history. The spirit of Fuller's preaching, always characterized by calmness and moderation, gave offense to the high royalists, who charged him with lukewarmness in their cause. To silence unjust censures, he became chaplain to the regiment of the excellent Lord Hopton. After the defeat of Hopton at Cheriton Down, Fuller retreated to Basing House. He took an active part in its defense, and was once incited by the noise of the enemy's artillery, which disturbed him at his books, to head a sally upon the trenches. His life with the troops caused him to be afterward regarded as one of "the great cavalier parsons." In his marches with his regiment round about Oxford, and in the west, he devoted much time to the collection of details, from churches, old buildings, and the conversation of ancient gossips, for his *Church History and Worthies of England*. His patriotism in the national crisis was evidenced in many ways. For the soldiers and the more religious of the royalist party he compiled, 1645, a small volume of prayers and meditations—the *Good Thoughts in Bad Times*—which, set up and printed in the besieged city of Exeter, whither he had retired, was called by himself "the first fruits of Exeter press." It was inscribed to Lady Dalkeith, governess to the infant princess, Henrietta Anne, who was born at Exeter, June 16, 1644. Fuller was, by the king, placed in the household of the princess through the influence of Lady Dalkeith. In this city, as elsewhere, he attracted to himself a circle of friends. The corporation gave him the Bodleian lectureship, and he held it until after the surrender of the city to the Parliament. *The Fear of Losing the Old Light* was his farewell discourse to his Exeter friends. Under the Articles of Surrender, Fuller made his composition

with the government at London, his "delinquency" being that he had been present in the king's garrisons. In a characteristic petition to compound, dated June 1, 1646, he acquainted the committee that he was then lodging at "the Crown" in St. Paul's church-yard (the sign of his bookseller, Williams); and the word *Crown* is written in large letters and designedly falls in the center of the document, in which, moreover, there are traces of the disagreeable position in which he was placed. In a life of Andronicus, 1646, partly authentic and partly fictitious, he satirized the leaders of the revolution; and more than one edition of this little book was called for. For the comfort of sufferers by the war he issued, 1647, a second devotional manual, entitled *Good Thoughts in Worse Times*, abounding like its predecessor and its successor, in fervent aspirations, and drawing moral lessons in beautiful language out of the events of his life, or the circumstances of the time. In grief over his losses, which included his library and manuscripts, and over the calamities of the country, he wrote his work on the *Wounded Conscience*, 1647. Under the countenance of citizens whose names are perpetuated in the dedications in his books, Fuller, in 1647, began to preach at St. Clement's, East Cheap, and elsewhere, in the capacity of lecturer. While at St. Clement's he was suspended; but speedily recovering his freedom, he preached wherever he was invited. Among Fuller's noble patrons was the earl of Carlisle, who made him his chaplain, and presented him to the curacy of Waltham Abbey. His possession of the living was in jeopardy on the appointment of Cromwell's "Tryers;" but he evaded the inquisitorial questions of that dreaded body by his ready wit. Nor was Fuller disturbed at Waltham in the "dangerous year" 1655, when the Protector's edict prohibited the adherents of the late king from preaching. Moreover, Lionel, third earl of Middlesex, who lived in the parish, gave him what remained of the books of the lord treasurer his father; and through the good offices of the marchioness of Hertford, part of his own pillaged library was restored to him. Under such circumstances Fuller actively prosecuted his literary labors, producing successively, at great cost, his survey of the Holy Land called *A Pisgah-Sight of Palestine*, 1650; and his *Church-History of Britain*, 1655, from the birth of Jesus Christ until the year 1648. His last and best patron was the Hon. George Berkeley of Cranford House, Middlesex, whose chaplain he was, and who gave him Cranford rectory, 1658. To this nobleman Fuller's reply to Heylin, called *The Appeal of Injured Innocence*, 1659, was inscribed. This remarkable and instructive book embraces, as its editor, Mr. James Nichols, has remarked, "almost every topic within the range of human disquisition, from the most sublime mysteries of the Christian religion, and the great antiquity of the Hebrew and Welsh languages, down to *The Tale of a Tub*, and criticisms on Shakespeare's perversion of the character of Sir John Falstaff." The only other important works issued by Fuller in his lifetime were connected with the Restoration. The revived Long Parliament, December, 1659, proposed an oath of fealty to the Commonwealth, and the abjuration of Charles II. and his family. The matter was much debated; and in an able letter published in February 1660, which went into a third edition, called *An Alarm to the Counties of England and Wales*, Fuller discussed the proposal. His arguments tended to swell the cry for a free and full parliament—free from force, as he expressed it, as well as from abjurations or previous engagements. In anticipation of the meeting of the new parliament, April 25th, and as if foreseeing the unwise attitude of those in power in relation to the

reaction, Fuller put forth his *Mixt Contemplations in Better Times*, 1660, dedicated to Lady Monk. There is good reason to suppose that Fuller was at the Hague immediately before the Restoration, in the retinue of Lord Berkeley, one of the commissioners of the House of Lords, whose last service to his friend was to interest himself in obtaining him a bishopric. A *Panegyrick to His Majesty on his Happy Return* was the last of Fuller's verse-efforts. On August 2d, by royal letters, he was admitted D.D. at Cambridge, as a scholar of integrity and good learning, who had been hindered in the due way of proceeding to his degree. His former preferments were restored to him. At the Savoy Pepys heard him preach; but he preferred his conversation or his books to his sermons. Fuller's last promotion was that of chaplain in extraordinary to Charles II. In the summer of 1661 he visited the west in connection with the business of his prebend, and upon his return he was seized with a kind of typhus-fever called the "new disease." On Sunday, August 12th, while preaching a marriage sermon at the Savoy, he was disabled from proceeding; and at the close of the service he was carried home in a sedan to his new lodgings in Covent Garden, where he expired, Thursday, August 16th, aged fifty-four.

FULLER'S EARTH, so named from its use by fullers as an absorbent of the grease and oil of cloth, is an earthy hydrated silicate of aluminum.

FULMAR, from the Gaelic *Fulmaire*, the *Fulmarus glacialis* of modern ornithologists, one of the largest of the Petrels of the northern hemisphere, being about the size of the Common Gull and not unlike it in general coloration, except that its primaries are gray instead of black. This bird, which ranges over the North Atlantic, is seldom seen on the European side.

FULTON, ROBERT (1765-1815), an American engineer and mechanician, was born in 1765 at Little Britain in Pennsylvania. At the age of seventeen he adopted the profession of a portrait and landscape painter, but he also, even then, devoted a considerable portion of his time to mechanical pursuits.

Fulton invented various machines and improvements upon machines, flax-spinners, rope-twisters, canal-locks, and was continually occupied thus until 1793, when, rightly impressed with the future importance of steam navigation to American commerce, he turned his attention to that subject. That which seems so very commonplace now was then a task not considered practically possible. Fulton had made many failures, once after having had \$5,000 voted him by congress for experimenting upon a sub-marine torpedo. Steam navigation had been tried, but in all cases had practically failed. This man's merit rests upon persistence in trying until impossibility is demonstrated.

After importing engines from Europe to use in his experiment, Fulton's steamboat, the Clermont, made the trial trip to Albany in thirty-six hours. It was exceedingly slow, and very imperfect, but it was capable of making a journey in that time which had previously required seven to ten days. It established a fact that has been growing ever since, and is of inestimable value.

There are now no details of construction and cost of this first steamboat extant, and they are entirely unimportant. Fulton left a written description of the trial, which is often quoted. Of the supposed drawings of the Clermont no two are alike. In immediately succeeding improvements, original details were forgotten. The boat was probably propelled by a beam-engine, with the paddle-wheels uninclosed, and was probably also equipped with sails.

Fulton afterwards constructed many other steam

vessels, among them, in 1814, the first steam war-vessel ever built by the United States. But the patent-office was then in its infancy, and he failed to secure adequate protection upon his inventions. He died February 24, 1815, probably unconscious of the far-reaching results on the rivers of the United States that his achievement would bring about.

FULMINATE OF MERCURY, or FULMINATING MERCURY ($\text{HgC}_2\text{N}_2\text{O}_2$), is best prepared by dissolving 3 parts of mercury in 36 of nitric acid of specific gravity 1.34, without the application of heat in a flask capable of holding eighteen times the bulk of the acid. The solution is then to be poured into a large vessel containing 17 parts of alcohol of specific gravity 0.830, and immediately to be retransferred to the flask, which is still full of nitrous vapors, and with which it must be well shaken, in order to effect their absorption. Effervescence commences in a few minutes, and soon becomes extremely violent; and at the same time there is a deposit of metallic mercury, which is gradually redissolved. The reaction must be moderated by the gradual addition of 17 parts more of alcohol; and on cooling, crystals of the fulminate, amounting to 4.6 parts, are deposited. These must be washed with cold water, and dried at 100° F. Fulminate of mercury forms white, silky needles. It may be handled without much danger when moist; but when dry, it explodes with violence when struck by a hard body, or when touched with nitric or strong sulphuric acid. A mixture of 1 part of this salt with 6 parts of niter, or of 3 parts of the fulminate, 5 of chlorate of potash, 1 of sulphur, and 1 of ground glass, is employed as the priming of percussion caps. It is applied as a dry powder, and is made to adhere to the cap by the application of a drop of shellac varnish.

FULMINATE OF SILVER, or FULMINATING SILVER ($\text{AgC}_2\text{N}_2\text{O}_2$), is prepared in nearly the same manner as the fulminate of mercury. It is more powerfully explosive than the last named salt. Even when moist or under water, pressure with a hard body will cause its explosion; and when quite dry, the slightest friction between two hard bodies produces a similar result.

FUMITORY, a genus of annual, rarely perennial, herbs of the natural order *Fumariaceae*.

FUNCHAL. See MADEIRA. Pop. (1900), 150,528.

FUNCTION. Functionality, in Analysis, is dependence on a variable or variables; in the case of a single variable u , it is the same thing to say that v depends upon u , or to say that v is a function of u , only in the latter form of expression the mode of dependence is embodied in the term "function."

FUNDS, FUNDING SYSTEM. See NATIONAL DEBT.

FUNEN. See DENMARK.

FUNERAL RITES, ceremonies attending the burial, burning, or disposal otherwise of the dead.

Next to exposure, burial is the simplest method of disposal, and it is the most widespread, being common alike to the lowest and the highest forms of culture. Burial likewise has its varying customs, from laying the body in natural holes or caves to erecting over it majestic temples. A common practice is simply to lay the body out on the ground and pile stones, or as among the Moors, prickly thorns, over it to keep off beasts. The use of the coffin is no sure test of culture, for while some of the rudest peoples lay the dead in a hollowed trunk or a boat, the Mahometan nations use nothing of the kind. Nor is the possession of fixed burying places a better index to the stage of development, for while many primitive tribes have stated burial places, the more advanced Mexicans had none.

Refinements upon ordinary burial are the practices of

first burning the dead, or embalming them, or drying them on trees or artificial scaffolds, before burying them. That plain burial is the earlier custom, and that these other more elaborate and costly fashions are later engraftments upon it, seems to be proved by the fact that many nations adopt more than one custom, and that, while they only bury their women, they first burn or dry their men. The ancient Colchians suspended the corpses of men in trees, but their women they buried. The Gonds and Bhils of India, who have adopted under Hindu influences the practice of burning, still bury their women, while the Todas burn all now, except children, the victims of infanticide, whom they bury. The Mud-dikers, who bury, burn lepers, probably from sanitary reasons; and certain tribes who burn bury the lightning-struck on the spot where they fall. The Kalmucks follow all modes; their usual custom is exposure; but they also burn, or bury, or throw the corpse into the water, or under a heap of stones, or build a hut over it, according to what the priest declares to be most suitable to the condition of the deceased.

Another point of interest in burying is the position of the body in the grave. Some bury their dead lying, others sitting, and there is a remarkable consensus of custom for the practice of laying the body east and west, sometimes with the head to the east and sometimes to the west. This custom is evidently due originally to solar symbolism, and the head is turned to the east or to the west, according as the dead are thought of in connection with the sunrise, the reputed home of deity, or with the sunset, the reputed region of the dead. This practice, however, though nearly universal is not absolutely so, for some tribes lay their dead north and south; and others, like the Bongos, bury men with their face to the north and women with the face to the south; while if one of the Wanyamwesi in Africa happens to die abroad, he is buried facing his native village.

The necessary act of disposing of the corpse has always been accompanied by ceremonies expressive (1) of affection for the deceased or grief for his loss; (2) of present interest in and solicitude for his welfare; (3) of a certain mysterious fear of him in his present state; and (4) of affectionate remembrance of him. These ceremonies vary much under different changes of culture, yet have all the same central elements.

Among primitive nations the most common ceremonial expressions of grief are simple exaggerations of the natural expressions of the emotions,—a carelessness as to usual comforts, and a positive distracting agony. Fasting, neglecting the hair, wearing rags or sackcloth, sitting in ashes, daubing oneself with mud or pigment, are almost universal examples of the one; while ringing the hands, tearing the hair, shaving the head, beating the breast, are common examples of the other.

The most interesting funeral rites, however, are those which express men's ideas of the present state, and their solicitude for the present welfare, of the deceased. There is no nation which does not believe that the soul continues to exist after its separation from the body, in another world like the present, but invisible. Many of the funeral rites of the nations are determined by the belief that death is a journey of the soul from this world to that other, and are meant to provide necessary entertainment for the dead on the way, or even after arrival. Meat, drink, weapons, light, musical instruments, horses, money, servants, wives, are among the most usual things buried with the body.

Graver sacrifices, of animals, wives, and slaves, for the permanent use of the deceased in the next world, have prevailed at one period or another among most nations of Asia, Africa and America. They are con-

spicuously absent from the Semitic peoples, though even among them a trace is found in the Arab custom of leaving the dead man's camel to die on his grave. Of human funeral sacrifices, Hindu suttee is the best known instance. The Fijians strangle wives, slaves and friends to attend the deceased. The Dyaks of Borneo make head-hunting a main business of this life, under the impression that every person whose head they secure will serve them in the next. A kind of suttee by symbol still survives in certain nations when the sacrifice itself is abolished.

The affectionate commemoration of the deceased takes many forms, from simply mourning for a definite period up to periodical funeral feasts, the erection of memorial images, the preservation of the relics as instruments of superhuman power and the worship of the Manes. The natives of Dahomey keep up intercourse with the departed by killing a slave from time to time, whose soul is supposed to go to the dead with the news of the living. The Guinea negroes used to keep the bones of their friends in chests and go occasionally and hold conversation with them. The Mandan women in North America take food year by year to their dead kinsfolk, whose skulls have been preserved in circles of 100 on the prairie. Funeral feasts prevail extensively in America, Africa and Asia, and arise partly, like our own anniversary dinners, from a simple desire to do honor to the dead, but partly also from the belief that the dead participate in the good cheer. They are not merely commemorative but communion meals. Funeral games were probably, like the elaborate dressing of the dead in Brazil and other places in the robes of their patron saints or deities, merely designed to show respect.

To come now to the more cultured peoples, the Greeks either buried or burnt their dead. The body was anointed, crowned with flowers, dressed handsomely and usually in white, laid out in a bed of state with an obolus in its mouth for Charon and a honeycake for Cerberus. These offices were performed by the female relations. The kinsfolk gathered round the bed, and lamented and tore their clothes and hair. On the third day after the death the body was carried out by the friends in a coffin, usually of earthenware, before sunrise—men walking before it, women, attended by the hired mourners, behind—and was buried outside the town. A monument with inscription was raised over the grave. All who took part in the funeral needed to be purified before they could again enter the temples of the gods. Funeral sacrifices were offered on the third, ninth and thirtieth days after. On the last of these days stated mourning ended, and the relatives might appear in public again. It was customary afterward to visit the tomb and leave garlands, and burn meals as offerings to the dead.

The Roman ceremonies were analogous. Burial was the earlier custom. Burning was not general till the republic, but was universal under the empire; the preparation of the body for burial or cremation was performed by a hired body called *pollinctores*. The corpse was dressed in its best,—if a magistrate, in official robes; and if he had while alive been crowned, then wearing the crown. In early times the burial took place at night, but in later times this was the practice only of the poor who could not afford a funeral display. On the eighth day the body was carried to the grave in a stone coffin on a wooden, or in some cases a golden, bier, amid music and lamentation, and sometimes mimic representations of the life and merits of the deceased by professional players. The sons of the deceased went veiled, and the women beat their breasts. When the body was burned, oil, perfumes, ornaments, and everything supposed to be agreeable to the deceased

were thrown into the fire. On returning from the funeral, friends were purified by sprinkling themselves with water or stepping over a fire. Mourning lasted nine days, and on the ninth a funeral sacrificial feast was celebrated, sometimes with games and gladiatorial combats.

The funeral rites of ancient Egypt were too elaborate to be described here. Their chief peculiarities were the embalming of the body and the judgment of the dead before burial.

The Mahometans bury their dead usually on the day of death. The prophet forbade wailing, but this prohibition is generally neglected. Even hired wailing women are employed by some, who wail during all the time the corpse is in the house and on the way to the grave; parts of the Koran are recited by religious officials in the house.

Christian rites are marked by high reverence for the body, due to the belief in its future resurrection. Under Christian influence cremation gradually disappeared from Europe, northern and southern alike, and burial became universal, as being more expressive of the truth held so precious. Christians bury in separate places of their own, which, except among Presbyterians and other sections of Protestants, have been usually consecrated for the purpose by a special ceremony. Interment in churches of favorite martyrs and apostles was at one time much sought after, and had to be repeatedly forbidden by ecclesiastical councils. Bishops and distinguished churchmen or laymen were sometimes allowed to be buried in the church, only not near the altar. Among the early Christians the washing and anointing of the body for the burial were not done by hired persons, but were counted a work of love, done by friend for friend, and by the charitable for the poor and the stranger. The body was swathed in white, decked sometimes with the insignia of office or personal ornaments, placed in a coffin and laid out in the church or in the chamber of death for friends to come and take the last look at it. Three or four days usually elapsed between the death and burial, and vigils were held with prayers and hymn-singing. Hired mourners were forbidden. The funeral took place by day, for, Christian death being a victory, it was meant to give the procession the aspect of a triumph; for which reason those who took part in it carried branches, not of cypress, as among the Romans, but of palm and olive. Evergreen leaves were strewn on the coffin, but the practice of crowning the head with wreaths was forbidden, as savoring of idolatry. Lamps and torches, however, were sometimes carried. The body was borne on a bier, and covered with a pall costly in proportion to the rank of the deceased. It was laid in the grave with face upward and feet to the east, in token of the resurrection at the coming again of the Sun of Righteousness. A service took place at the grave, and, as a rule, does so still among most Christians.

FÜNFHAUS, FÜNFHÄUSEL, formerly **HANGENDEN-LISSEN**, a flourishing and populous suburb to the southwest of Vienna, forming, along with **Sechshaus** proper and **Rudolfsheim**, the commissariat of **Sechshaus**, and trending in a westerly direction toward **Schönbrunn**.

FÜNFKIRCHEN, a royal free city of Hungary, capital of the vármegye or county of **Baranya**, is situated on the declivity of **Mount Mecsek**, and on the railway to **Mohács**. It is one of the oldest and finest towns in Hungary, and is the seat of a bishop and of the county administration.

FUNGUS is the name applied to a distinct class of cellular cryptogams or *Thallophyta*. Though as plants the class is well marked by the invariable absence of chlorophyll, and consequently of the physiological phe-

nomena attending its presence and action, it is not so at some points, where a dubious border exists between it and the lower members of the animal kingdom.

The vegetative body or thallus of fungi consists of filiform, cellular elements called *hyphæ*. In one group, the *Phycomycetes*, the hypha usually consists of a single densely branching cell; but in most cases it is composed of a series of cells placed end on end. These hyphæ ramify laterally much more frequently than dichotomously, and the usual mode of growth is by an apical cell which divides transversely; but in the bodies of the larger fungi intercalary growth also occurs (as in *Rhizomorpha subterranea*). A single hypha forms the complete thallus of the simpler fungi called *Hyphomycetes*, *Haplomycetes*, etc., but the bodies of the larger (compound) fungi are composed of a colony of hyphæ, usually densely interwoven, more rarely running in parallel lines, but always more or less firmly adhering together. In many fungi the fully developed tissue consists of polyhedral cells, closely packed, and bearing resemblance to *parenchyma*. This texture, however, consists of ordinary hyphæ, which, through pressure from adjacent parts, have been forced to assume this form.

FUR. Certain animals, which inhabit the colder climates, have a covering upon the skin called fur, lying alongside of another and longer covering, called the overhair. The fur differs from the overhair in that it is soft, silky, curly, downy, and barbed lengthwise, while the overhair is straight, smooth, and comparatively rigid. These properties of fur constitute its essential value for felting purposes, and mark its difference from wool and silk; the first, after some slight preparation by the aid of hot water, readily unites its fibers into a strong and compact mass; the others can best be managed by spinning and weaving.

On the living animal the overhair keeps the fur filaments apart, prevents their tendency to felt, and protects them from injury—thus securing to the animal an immunity from cold and storm—while, as a matter of fact, this very overhair, though of an humble name, is most generally the beauty and pride of the pelt, and marks its chief value with the furrier. We arrive thus at two distinct and opposite uses and values of fur. Regarded as useful for felt, it is denominated staple fur, while with respect to its use with, and on the pelt, it is called fancy fur. For the one purpose the Russian hare skin is more valuable than the Russian sable, while for the other the sable may be valued at one thousand times the former.

The manufacture of fur into a felt is of comparatively modern origin, while the use of fur pelts as a covering for the body, for the couch, or for the tent is coeval with the earliest history of all northern tribes and nations. They were not simply a barbarous expedient to defend man from the rigors of an arctic winter; woven wool alone cannot, in its most perfect form, accomplish this. The pelt or skin is requisite to keep out the piercing wind and driving storm, while the fur and overhair ward off the cold; and they are as much a necessity to-day among more northern peoples as they ever were in the days of barbarism. With them the providing of this necessary covering became the first purpose of their toil; subsequently the article grew into an object of barter and traffic, at first among themselves, and afterward with their neighbors of more temperate climes; and with the latter it naturally became an article of fashion, of ornament and of luxury. This, in brief, has been the history of its use in China, Tartary, Russia, Siberia and North America, and at present the employment of fancy furs among the civilized nations of Europe and America has grown to be more extensive than at any former period. The supply

of this demand in earlier times led to such severe competition as to terminate in tribal pillages and even national wars; and in modern times it has led to commercial ventures on the part of individuals and companies, the account of which, told in its plainest form, reads like the pages of a romance. Furs have constituted the price of redemption for royal captives, the gifts of emperors and kings, and the peculiar badge of state functionaries. At the present day they vie with precious gems and gold as ornaments and garniture for wealth and fashion; but by their abundance, and the cheapness of some varieties, they have recently come within the reach of men of moderate incomes. The history of furs can be read in Marco Polo, as he grows eloquent with the description of the rich skins of the khan of Tartary; in the early fathers of the church, who lament their introduction into Rome and Byzantium as an evidence of barbaric and debasing luxury; in the political history of Russia, stretching out a powerful arm over Siberia to secure her rich treasures; in the story of the French occupation of Canada, and the ascent of the St. Lawrence to its source in Lake Superior, and the subsequent contest to retain possession against England; in the early settlements of New England, New York, and Virginia; in Irving's *Astoria*; in the records of the Hudson's Bay Company; and in the annals of the fairs held at Nijni-Novgorod and Leipsic. Here it may suffice to give some account of the present condition of the trade in fancy furs. The collection of skins is now chiefly a matter of private enterprise. Few, if any, monopolies exist. The Alaska Commercial Company, now twenty-five years old, enjoys some special privilege for the taking of seal skins on the Pribiloff Islands, and some peculiar restrictions exist in Russia in relation to certain peltries, but beyond this the trade in furs is a free one the world over. Individual enterprise, skill, forecast, and capital, have an open field. The Hudson's Bay Company, with its chief office in London, still maintains its organization, but conducts its affairs in North America under no special or royal grant, and competes in the open market with individual traders throughout Canada, Labrador, Manitoba, and Columbia. Its collection of peltries is offered to the highest bidder at public auction in London, in January, March, and September of each year.

Private collectors and dealers throughout Canada and the United States forward their furs to the seaboard, chiefly to New York, for sale there, or for consignment principally to London and to Leipsic. The latter town still maintains the custom of spring and autumn fairs, at which most kinds of wares are sold or exchanged with dealers from Turkey, Austria, and Russia. Nijni-Novgorod is the chief fair for European Russia, though very important fairs are also held in Kasan and in Irbit among the Ural Mountains. The most important fair for eastern Siberia is held at Kiachta, on the borders of China, where an extensive exchange of furs is carried on with the Celestials. Japan has added but little to the activity or extension of the fur trade, though her northern shores have furnished many a fine fur seal and sea otter to the hardy navigator. Staple furs, or those used chiefly in the manufacture of hats, are those of the hare and the rabbit, collected mainly in Russia, Germany, France, and England, dressed, carotred, and cut from the skin in western Germany, France, Belgium, and England, and thence distributed to the manufacturing centers of the world; and here it may be added that the clippings and cuttings of fancy furs from the workshops of furriers are all saved, and find their way to the machinery which utilizes the waste and transforms them into hatters' furs. But of all these fur marts that of London is the chief, for thither tend by the laws of

trade, not only much of the produce of Asia and Europe, but also the fine peltries of Chili and Peru, the nutria from Buenos Ayres, the fur seal of Cape Horn and South Shetland, the hair seal from Newfoundland, as well as the inferior peltries of Africa. To prepare fur skins in a way to endure this long transportation is a simple and easy matter. When stripped from the animal the flesh and fat are carefully removed, and the pelts hung in a cool place to dry and harden; nothing is added to protect them. Care is taken that they do not heat after packing, and that they are occasionally beaten to destroy worms. A marked exception is the case of the fur seal, which is best preserved by liberal salting and packing in hogsheads. All other raw furs are marketed in bales.

Few kinds of animals furnish a pelt of suitable weight and pliability, and all of them differ widely in elegance of texture, delicacy of shade, and fineness of overhair, and it is these differences which determine their place in the catalogue of merchandise. These few animals are not very prolific, and many of them attain their greatest beauty in wild and uncultivated regions. To this remark there are some notable exceptions. Being thus few in kind, and limited in quantity, one might fear the extinction of the several choice varieties through the persistent energy of the trapper. But here the fickleness of fashion steps in, and does for the fur trade what the law of supply and demand does for the more staple articles of commerce. Fashion, fastidious, and fickle, neglects the use of certain kinds for a season; the market price of the pelt no longer repays the outfit of the trapper; the hunt is intermitted, and in two or three years the animal regains its numbers and strength.

Of the fur-bearers, those that seek their food in water have their finest but shortest fur on the belly, and longer fur upon the back; while those that avoid the rivers have their longest and finest fur upon the back, and their bellies clothed with fine, long, flowing overhair.

Raw furs are made ready for use by softening the pelt with pure butter or sweet oil, tramping them in tubs filled with fine hardwood sawdust at about blood heat, drawing the pelt over a sharp knife to remove every particle of flesh, and finally tramping them again in clean sawdust. The pelt thus becomes soft and pliable like the fine kid used for gloves. They are then ready for the furrier, who sorts the skins as to color and overhair, and cuts them in various ways to bring them to the pattern of the article required. Having been sewed together with a close, fine overseam, the article is damped, and stretched upon a smooth pine board after a pattern marked, then nailed along its edges and left to dry. After removal from the board the article is trimmed, and softened by rubbing, and is then ready for the liner. The skill of the furrier lies in the taste exhibited in the arrangement of the furs, and in the economy of use of material.

Furs are dyed in a variety of ways to make them uniform in color, and adapt them to the fashion and taste of the time. Ordinarily this is a cheap and ready process, and only becomes an art when employed upon fine skins, from which the overhair has been first removed by plucking, leaving the fur alone to receive the dye-stuff. Among these are the skins of the musk rat, beaver, otter, and especially the fur seal; the last has received very careful attention, as its entire value depends upon the perfection and success of the process. Unprime fur seals part with their overhair very reluctantly, while the seasoned skins are very readily unhaired, leaving the fur in all its smoothness; thus the best grades are likely to be very good, while the rest rank only from ordinary to very common. A subse-

quent process is the removal of all grease from the fur, which is effected by repeated washings in softened water; if this is imperfectly done, the color will be uneven and not permanent. The final work is to prepare a dye of suitable strength, and apply it in a suitable way, to infuse the coloring matters into the fur, without suffering too much of it to reach the pelt, whereby its durability might be ruined. London claims to have accomplished this for the sealskin in a manner that distances all competition; and it certainly enjoys a wide popularity, as well as the substantial fruits of the sale of its production of colored seals. But America also has its successful dyers of seals, one of the most important of the results they have achieved being the giving to the fur seal a fine deep brown color, without injuring or burning the fur, while leaving the pelt soft, light, and durable.

FUREEDPORE. See FARIDPUR.

FURETIÈRE, ANTOINE, best known as the author of a *Dictionnaire Universel de la Langue Française*, was born at Paris in 1620, and died May 14, 1688.

FURIES are not native to Latin mythology, but adopted and modified from the Greek *Erinyes* (see *ERINYES*). Originally denoting the avenging power exerted by nature against all transgressors of its regular order, and spoken of by older poets either simply in the singular or in the plural as an indefinite number, the *Erinyes* assumed later a more rigid and methodical form. As the conception of a future life grew, they were invested with the duty of punishing sinners, and were settled in Tartarus; their number was fixed down to the sacred three, and individual names, Allecto, Tisiphone, and Megæra, occur first in the Alexandrian poets and are adopted in Latin. But beside this, Virgil, and the later poets in imitation of him, frequently employ the *Furiæ* in another way which is also suggested by a Greek original. The *Erinyes* are said to madden the transgressor and lead him into further crimes which work their own punishment; and Æschylus by a strong metaphor calls Helen an *Erinyas*, as it were, a scourge of men (*Agam.* 729). Virgil develops this thought so as to make the *Furiæ* the agents employed by the higher gods to stir up all mischief and strife and hatred on the earth.

FURNACE. Under this name are included all contrivances for the production and utilization of heat by the combustion of fuel.

The word is common to all the Romance tongues, appearing in more or less modified forms of the Latin *fornax*. But in all those languages the word has a more extended meaning than in English, as it covers every variety of heating apparatus; while here, in addition to furnaces proper, we distinguish other varieties as *ovens*, *stoves*, and *kilns*. The first of these, in the form *Ofen*, is used in German as a general term like the French *four*; but in English it has been restricted to those apparatus in which only a moderate temperature, usually below a red heat, is produced in a close chamber. Our bakers' ovens, hot-air ovens or stoves, annealing ovens for glass or metal, etc., would all be called *fours* in French and *Oefen* in German, in common with furnaces of all kinds. Stove, an equivalent of oven, is from the German *Stube*, *i. e.*, a heated room, and is commonly so understood; but is also applied to open fire-places, which appears to be somewhat of a departure from the original signification.

Furnaces are constructed according to many different patterns with varying degrees of complexity in arrangement; but all may be considered as combining three essential parts, namely, the fire-place in which the fuel is consumed, the heated chamber, laboratory, hearth, or working bed, as it is variously called, where the heat is

applied to the special work for which the furnace is designed, and the apparatus for producing rapid combustion by the supply of air under pressure to the fire. In the simplest cases, the functions of two or more of these parts may be combined into one, as in the smith's forge, where the fire-place and heating chamber are united, the iron being placed among the coals, only the air for burning being supplied under pressure from a blowing engine by a second special contrivance, the tuyere, tuiron, twyer, or blast pipe; but in the more refined modern furnaces, where great economy of fuel is an object, the different functions are distributed over separate and distinct apparatus, the fuel being converted into gas in one, dried in another, and heated in a third, before arriving at the point of combustion in the working chamber of the furnace proper.

The most obvious distinction that can be used in the classification of furnaces is founded on the method adopted for supplying air, which may either be blown into the fire, under a pressure above that of the atmosphere sufficient to overcome the resistance presented by the packed columns of fuel and other materials to its free passage, or be drawn through it by a partial vacuum in a chimney formed by the heated gases on their way to the atmosphere. The former are known as *blast furnaces*, and the latter as *chimney draught, air, or wind furnaces*.

The blast furnace in its simplest form is among the oldest, if not the oldest, of metallurgical contrivances. In the old copper smelting district of Arabia Petraea, clay blast pipes dating back to the earlier dynasties of the ancient empire of Egypt have been found in great numbers, buried in slag heaps; and in India the native smiths and iron workers continue to the present day the use of furnaces of similar primitive types. These, when reduced to their most simple expression, are mere basin-shaped hollows in the ground, containing ignited charcoal and the substances to be heated, the fire being urged by a blast of air blown in through one or more nozzles from a bellows at or near the top. This class of furnace is usually known as an open fire or hearth, and is represented in a more advanced stage of development by the Catalan, German, and Walloon forges formerly used in the production of malleable iron, and still current to some extent in Sweden, Corsica, and a few places in central Europe.

The profile adopted for blast furnaces has been very much varied at different times. The earliest examples were invariably square or rectangular in horizontal section, and the same class of form has been retained in many instances up to the present time; but the general tendency of modern practice is to substitute round sections, their construction being facilitated by the use of specially molded bricks, which have entirely superseded the sandstone blocks formerly used. The vertical section, on the other hand, is subject to considerable variation, according to the work to which the furnace is applied.

Blast furnaces are, from the intimate contact between the burden to be smelted and the fuel, the least wasteful of heat; but their use supposes the possibility of obtaining fuel of good quality and free from sulphur or other substances likely to deteriorate the metal produced. In all cases, therefore, where it is desired to do the work out of contact with the solid fuel, the operation of burning or heat-producing must be performed in a special fire-place or combustion chamber, the body of flame and heated gas being afterward made to act upon the surface of the material exposed in a broad thin layer in the working-bed or laboratory of the furnace by reverberation from the low vaulted roof covering the bed. Such furnaces are known by the general name of *reverberatory* or *reverberatory furnaces*,

also as air or wind furnaces, to distinguish them from those worked with compressed air or blast.

FURNITURE is the name, of obscure origin, used to describe the chattels and fittings required to adapt houses, churches, ships, etc., for use. The sculptures, paintings, and metal work of antiquity, of the Middle Ages, and of the Renaissance, now kept in museums and private collections, have, with few exceptions, formed part of decorations or of furniture made for temples, churches, or houses. Most of our ancient bronzes, if not images taken from ancient shrines, are pieces of mirrors, tripods, altar vessels, even the dishes and pans of the kitchen. Wood, ivory, precious stones, bronze, silver and gold, have been used from the most ancient times in the construction or for the decoration of seats, chests, tables, and other furniture, and for the shrines and altars of sacred buildings.

The kind of objects required for furniture have varied according to the changes of manners and customs, as well as with reference to the materials at the command of the workman, in different climates and countries. Of the furniture of the ancient Egyptians there remain several examples. The British Museum contains six chairs, about the same in height as those now used. One is of ebony, turned in the lathe and inlaid with collars and dies of ivory. It is low, with a back; and both back and legs are strengthened with rails of cane. The seat is of plaited cane slightly hollowed. Another is shaped out of two frames of four pieces of wood each, hinged in the centers of the longer sides, the lower ends carved into the form of the heads of animals; the seat has been made of skin or other flexible material so as to fold flat. Some Egyptian couches and seats had the legs carved like those of panthers; some had the arms or seat supported by figures representing slaves or captives taken in war. They were upholstered with rich stuffs, and are accurately represented in wall paintings. Workmen's tables, massive blocks of wood with four plain legs, and head rests hollowed out, standing nine or ten inches high, are preserved in the British Museum — some being of alabaster, probably for the sake of coolness. Painted wood chests, with convex lids (not hinged) and mummy cases can be seen both in the British Museum and in the Louvre in Paris.

The excavations of Nineveh have brought to light sculptured representations of Assyrian seats. They were massive, the ends of the seat frame projected in the shape of rams' heads; in some instances figures of captives support the arms; in one described by Sir H. A. Layard, two horses resting on the lower bars from front to back support the seat. The seats were cushioned or upholstered with rich materials. An elaborate piece of carved ivory, with depressions to hold colored glass, agate, etc., from Nineveh, now in the British Museum, has been inlaid into a throne — showing that such objects were sometimes richly decorated. The carving is apparently of Egyptian origin. The furniture of the Assyrians was more massive, and less varied and elegant in execution, than that of the Egyptians.

Greek seats are sculptured in the Parthenon frieze now in the British Museum. They resemble turned wood structures, though perhaps representing bronze. The arms are low and straight, and the backs upright. A curious chair of this kind is represented on one of the bas reliefs from Xanthos (British Museum). In the same collection will be seen statues seated in chairs framed in square bars, the horizontal pieces mortised into the upright, and these details are carefully represented in marble. Certain far-famed gold and ivory statues of colossal size, at Olympia and other places, were represented seated. The bars and frames of the chairs, and of the footstools and pedestals, were constructed of cedar

wood, colored and inlaid with plates of sculptured ivory, and of gold and other precious materials. A sacred chest with carved lid, a table covered with ivory carvings, and other objects in these shrines are described by Pausanias.

The Romans employed Greek artists and workmen. Their chairs, couches, and seats were of similar shape to those of the Greeks. During meals men reclined on couches each made to hold three persons; a low rail protected the back; three of these couches surrounded the table at entertainments, leaving the fourth side open for service. The decoration consisted of rich coverings, constantly changed to suit the season, or in honor of the guests. Women sat during meals.

The chair of St. Peter in Rome, a solid square seat, with pedimental back and paneled with carved ivory, that of St. Maximian in the cathedral of Ravenna, round backed, with arms also paneled with carved ivory, and many representations on carved ivory diptychs or tablets, will give the student a correct notion of the furniture of the divided empire. The character of the curule chair survived and may be recognized in the Bayeux tapestry (St. Edward's seat), and in many mediæval paintings. The architectural features so prominent in much of the mediæval furniture begins in these Byzantine and late Roman thrones. These features became paramount as Pointed architecture became general in Europe, and scarcely less so during the Renaissance. Most of the mediæval furniture, chests, seats, trays, etc., of Italian make were richly gilt and painted. In northern Europe carved oak was more generally used.

Renaissance art made a great change in architecture, and this change was exemplified in furniture. Cabinets and paneling took the outlines of palaces and temples; sometimes they were actually, constructed in perspective, e.g., a small theater front at Vicenza, the work of the younger Palladio. Curious internal fittings were arranged in cabinets, still following the details of architectural interiors. In Florence, Rome, Venice, Milan, and other capitals of Italy, sumptuous cabinets, tables, chairs, chests, etc., were made to the orders of the native princes. Examples of sixteenth-century chests, cabinets, tables, seats, sideboards, etc., can be seen in museums, and in many private houses. *Pietra dura*, or inlay of hard pebbles, agate, lapis lazuli, and other stones, ivory carved and inlaid, carved and gilt wood, marquetry or veneering with thin woods, tortoise-shell, brass, etc., were used in making sumptuous furniture during the first period of the Renaissance.

The elegance of form and perfection of detail which are noticeable in the furniture of the sixteenth century, declined during the seventeenth all over Europe. The framework became bulky and heavy, and the details coarse. Silver furniture was made in considerable quantities by the Spaniards in Spain and Italy, and it was used in the courts of the French and English kings.

The system of veneering, or coating common wood with slices of rare and costly woods, fastened down with glue by screw presses made to fit the surface to be covered, came into general use in the eighteenth century. Marquetry is veneer of different woods, forming a mosaic of pictorial or ornamental designs. In Italy, in Spain, and throughout the dominions of Charles V. and his successors, figure subjects, architectural views, and quaint interiors were represented in these materials.

Looking-glasses in large sheets began to be exported from Venice at the end of the seventeenth century; some were engraved with figures on the backs. The manufacture was established at Tourlavlle, then in Paris, and about the same time at Battersea on the Thames — under Government protection in both coun-

tries. The light fantastic frames which came into fashion in France were called *rococo*. Carved and gilt furniture was made in Italy, where it was best designed, and all over Europe till late in the eighteenth century.

A return has been made during recent years to mediæval designs. In England there is a going back to the fashions prevalent during the first fifty years of the last century. The elegant Louis XVI. style is more popular in France.

As regards furniture of the day, and the proprieties which ought to be observed in form and decoration, it is a matter of regret that no definite style is recognized in Europe; there cannot but be some consequent waste of power and uncertainty of aim. A few general principles, however, are held to be applicable to the shape and arrangements of furniture of whatever style.

The mahogany carved chairs of Chippendale and Sheraton are often copied, but the repetitions have not the spirit of the originals.

FÜRUCKABAD. See FARRAKHABAD.

FÜRST, JULIUS (1805–1873), Orientalist, was born of Jewish parents at Zerkowo in Posen.

FÜRSTENBERG, the name of two noble houses of Germany.

I. The more important is in possession of a mediaetized principality in the district of the Black Forest and the Upper Danube, which comprises the countship of Heiligenberg, about seven miles to the north of the lake of Constance, the landgraviates of Stühlingen and Baar, and the lordships of Jungnau, Trochtelfingen, Hausen and Möskirch or Messkirch. The territory is discontinuous; and as it lies partly in Baden, partly in Würtemberg, and partly in the Prussian province of Sigmaringen, the head of the family is an hereditary member of the first chamber of Baden and of the chamber of peers of Würtemberg and in Prussia. The *Stammort* or ancestral seat of the family is Fürstenberg in the Black Forest, about thirteen miles north of Schaffhausen, but the principal residence or the present representatives of the main line is at Donaueschingen. The Fürstenbergs are descended from the courts of Urach, in the valley of the Ems, to the east of Tübingen—Henry I., the youngest son of Egon VI. of Urach, ranking as the founder of the family.

II. The second Fürstenberg family has its possessions in Westphalia and the country of the Rhine, and takes its name from the castle of Fürstenberg on the Ruhr, which is said to have been built by Count Dietrich or Theodoric of Oldenburg, in the eleventh century.

FÜRSTENWALDE, a town in the Prussian province of Brandenburg, government of Frankfort, on the right bank of the Spree, and on the railway between Berlin and Frankfort-on-the-Oder, twenty-eight miles east of the former city.

FÜRTH, an important manufacturing town of Bavaria, circle of Middle Franconia, at the confluence of the Pegnitz with the Rednitz, five miles northwest of Nuremberg, with which it is connected by railway. The population (1901) was 54,820.

FURZE, GORSE, or WHIN, *Ulex*, Linn., a genus of thorny papilionaceous shrubs, of few species, confined to west and central Europe and northwest Africa. Its chief use is in making fences.

FUSELI, HENRY, an eminent painter and writer on art, was born at Zurich, in Switzerland, in 1741. After taking orders in 1761, Fuseli was obliged to leave his country for a while in consequence of having aided Lavater to expose an unjust magistrate, whose family was still powerful enough to make its vengeance felt. He first traveled through Germany, and then, in 1763, vis-

ited England. By Sir Joshua Reynolds' advice he devoted himself wholly to art. In 1770 he made an art-pilgrimage to Italy, where he remained till 1778, changing his name from Füssli to Fuseli, as more Italian-sounding. Early in 1779 he returned to England, taking Zurich on his way. He found a commission awaiting him from Alderman Boydell, who was then organizing his celebrated Shakespeare gallery. Fuseli painted a number of pieces for this patron, and about this time published an English edition of Lavater's work on physiognomy. He likewise gave Cowper some valuable assistance in preparing the translation of Homer. In 1788 Fuseli married Miss Sophia Rawlins (who it appears was originally one of his models, and who proved an affectionate wife), and he soon after became an associate of the Royal Academy. Two years later he was promoted to the grade of Academician. In 1795 he exhibited a series of paintings from subjects furnished by the works of Milton, with a view to forming a Milton gallery corresponding to Boydell's Shakespeare gallery. In 1799 also he was appointed professor of painting to the Academy. Four years afterward he was chosen keeper, and resigned his professorship; but he resumed it in 1810, and continued to hold both office till his death. In 1805 he brought out an edition of Pilkington's *Lives of the Painters*, which, however, did not add much to his reputation. Canova, when on his visit to England, was much taken with Fuseli's works, and on returning to Rome in 1817 caused him to be elected a member of the first class in the Academy of St. Luke. Fuseli, after a life of uninterrupted good health, died at Putney Hill, 1825, at the advanced age of eighty-four, and was buried in the crypt of St. Paul's Cathedral. He was comparatively rich at his death, though his professional gains had always appeared to be meager.

FUSEL OIL, the name applied to the volatile oily liquids, of a nauseous fiery taste and smell, which are obtained in the rectification of spirituous liquors made by the fermentation of grain, potatoes, the must of grapes, and other material, and which, as they are of higher boiling-point than ethylic alcohol, occur in larger quantity in the last portions of the distillate.

FUST, JOHANN (?...–1466), often considered as the inventor or one of the inventors of printing, belonged to a rich and respectable burgher family of Mainz, which is known to have flourished from 1423, and to have held many civil and religious offices, but was not related to the patrician family of Fuss. The name was always written Fust, until in 1506 Johann Schöffer, in dedicating the German translation of Livy to the Emperor Maximilian, called his grandfather Faust. There is no evidence that John Fust was a goldsmith. He appears to have been a money-lender, or banker and speculator, better known for prudence than for uprightness and disinterestedness. His connection with Gutenberg, who is now generally, though not universally, admitted to be the real inventor of printing, has been very variously represented, and Fust has been put forward by some as the inventor of typography, and the instructor as well as the partner of Gutenberg, by others as his patron and benefactor, who saw the value of his discovery and had the courage to supply him with means to carry it out. This view has been the most popular; but during the present century Fust has been frequently painted as a greedy and crafty speculator, who took advantage of Gutenberg's necessity and robbed him of the fruits of his invention. Gutenberg, many years resident in Strasburg, where he was long engaged in the experiments and attempts which resulted in his discovery of typography, is not known to have been there after 1444. His uncle Henne (or Johann) Guten-

berg, senior, on October 28, 1443, took the house in Mainz called Zum Jungen, where Gutenberg afterward carried on printing. Having already exhausted his own resources in his long-continued and costly experiments, Gutenberg, through his cousin Albrecht Goltzsum zum Ehtzeller, borrowed 150 florins in Mainz October 6, 1448. This sum was quite insufficient for his purposes, and on August 22, 1459, as appears from the amount of interest afterward claimed, he made an agreement with Fust, who was to advance him 800 gold florins to make and procure his tools and materials, which were to be security for the loan. Fust was also to give him 300 florins a year for expenses, wages, house rent, parchment, paper, ink, etc. They were to divide the profits equally, and if they wished to separate, Gutenberg was to return the 800 florins, and the materials were to cease to be security. Fust was to have half the profits, being both holder of a mortgage and partner in the firm. Gutenberg carried on the business at Zum Jungen, where he lived. It is difficult to ascertain precisely what books were printed while the partnership lasted. Their greatest work was the *Latin Bible* known as the *Bible of Forty-two lines*, because a page contains forty-two lines, and also as the *Mazarin Bible*, because the first copy described was found in the library of Cardinal Mazarin. It was finished at latest in 1455, and is a folio of 1282 printed pages, with spaces left for the illumination of initials. Ulric Zell states, in the Cologne Chronicle of 1499, that Gutenberg and Fust printed the Bible in large type like that used in missals. It has been said that this description applies to the forty-two line Bible, as its type is as large as that of most missals earlier than 1500, and that the size now called missal type (double pica) was not used in missals until late in the sixteenth century. This is no doubt true of the smaller missals printed before 1500, some of which are in even much smaller type than the forty-two line Bible. It required scarcely less than such a work, says Madden, to induce Fust to advance such large sums of money. Some other smaller works were printed by the partners, as the Papal Letters of Indulgence of 1454-5, granted April 12, 1451, by Nicolas V., in aid of John II., king of Cyprus, against the Turks, and probably many now lost. Peter Schöffer of Gernsheim, between Mainz and Mannheim, who was a copyist in Paris in 1449, and who is called by Fust his servant (*famulus*), is said by Trithemius to have discovered an easier way of founding characters. Lambinet and others have concluded from this that Schöffer invented the punch. Schöffer himself, in the colophon of the Psalter of 1457, a work which probably was planned and partly printed by Gutenberg, claims only the mode of printing rubrics and colored capitals. Didot believes that Schöffer discovered the *movable* mold, and that Gutenberg alludes to this discovery and to Schöffer's youth when he says in the colophon of the *Catholicon* of 1460 that God reveals to babes what He hides from the wise. Fust, quite unexpectedly as it seems, and before the profits of the undertaking could be realized, brought a suit against Gutenberg to recover the money he had lent, claiming 2,026 florins for principal and interest. He had made a second loan of 800 florins in 1452, but had not paid the 300 florins a year, and, according to Gutenberg, had said that he had no intention of accepting interest. The suit was decided in Fust's favor, November 6, 1455, in the great refectory of the Barefooted Friars of Mainz, when Fust made

oath by all the saints that he had borrowed 1,550 florins and given them to Gutenberg. Fust removed the portion of the printing materials covered by his mortgage to the house belonging to him called Zum Humbrecht, where he carried on printing with the aid of Peter Schöffer, to whom he gave his only daughter Dyna or Christina in marriage about 1465. Their first publication was the Psalter, August 14, 1457, a folio of 350 pages, the first printed book with a complete date, and remarkable for the beauty of the large initials printed each in two colors, red and blue, from types made in two pieces, a method patented in England by Solomon Henry in 1780, and by Sir William Congreve in 1819. The Psalter was reprinted with the same types, 1459 (August 29), 1490, 1502 (Schöffer's last publication), and 1516. Fust is said to have gone to Paris in 1466, and to have died of the plague, which raged there in August and September. He certainly was in Paris on July 4th, when he gave Louis de Lavernade, a distinguished gentleman of the province of Forez, then chancellor of the Duc de Bourbon and first president of the parliament of Toulouse, a copy of his second edition of Cicero, as appears from a note in Lavernade's own hand at the end of the book, which is now in the library of Geneva. But Fust probably did not die until October 30th, on which day, probably in 1471, an annual mass was instituted for him by Peter Schöffer and Conrad Henliff in the church of St. Victor of Paris, where he was buried.

Fust has been often confounded with the famous magician Dr. Johann Faust, no doubt a real person, though the fables gradually gathered round his name have formed a regular mythical saga.

FUSTIAN, a term which includes a variety of heavy woven cotton fabrics, chiefly prepared for men's wear. It embraces plain twilled cloth called jean, and cut fabrics similar to velvet, known as velveteen, moleskin, corduroy, etc. The operations connected with the finishing of cut fustian (cutting, brushing and singeing, etc.) are conducted under unhealthy conditions. The name is said to be derived from El-Fustat, a suburb of Cairo, where it was first made; and certainly a kind of cloth has been long known under that name.

FUSTIC, or YELLOW WOOD, also known as old fustic, is a dye-stuff consisting of the wood of a large tree of the natural order *Moraceæ*, growing in the West Indies and tropical America, and having oblong, taper-pointed leaves, and an edible fruit. Fustic occurs in commerce in blocks, which are brown without, and of a brownish-yellow within. It is sometimes employed for inland work.

FUTTEHPOOR. See FATHIPUR.

FUX, JOHANN JOSEPH (1661-1741), the composer of more than 400 works of various kinds and dimensions, but chiefly remembered as the author of a theoretical work on music.

FYT, JOHANNES, was born at Antwerp August 19, 1609. He was registered apprentice to Hans van den Bergh in 1621. At twenty Johannes Fyt entered the guild of St. Luke as a master, and from that time till his death in 1661, he produced a vast number of pictures in which the bold facility of Snyders is united to the powerful effects of Rembrandt, and harmonies of gorgeous tone are not less conspicuous than freedom of touch and a true semblance of nature. He died in 1661.

FYZABAD, another name for FAIZABAD (*q. v.*)

G.

G represents the sound of Gamma, the third letter of the Greek alphabet; but in the Latin alphabet, and in the alphabets derived from the Latin (including our own) it holds the place which Z held in the different Greek alphabets. The history of this remarkable change is well known. It has been already stated (see letter C) that in the fifth century before our era, the distinction between the *k*-sound and the *g*-sound became lost in Rome; apparently the surviving sound was *g*; but, at all events, the symbol K went out of use, being retained only in a few familiar abbreviations, and C (which was the Latinized form of the Greek Γ) remained. Thus in the column of Duillius we find C representing the original surd in *castreis cepet*, etc., but the sonant in *macistratos, leciones, ceset* (i. e., *gessit*), etc. When, in the third century, the two sounds were again distinguished, two symbols were again required; but the K was not taken again to represent the surd; C, the old symbol for the sonant, was put to that use. A new symbol was therefore necessary for the sonant *g*-sound, and it was found by modifying C into G. This G should then have replaced C as the third letter of the alphabet, where it would have stood, as before, between B and D, the sonants of the labial and dental classes, respectively. But this was not done. The symbol C was left in its old place with its new value of *k*. The new symbol G was set in the seventh place of the alphabet, which had been vacated by Z, the representative of a sound not used by the Romans of that day. G is found for the first time in the inscription on the tomb of Scipio Barbatus. Its invention is attributed to Spurius Carvilius.

There can be no doubt that the sound of G in Latin, as of Γ in Greek, was always the sonant guttural—which we hear in *gate*, etc. It was not the sonant palatal, which it represents in *gem* or *gin*. This sound began to supplant it about the sixth century of our era, but only when it preceded *e* or *i*—the two vowels which require a position of the tongue nearer to the palatal than to the guttural consonants. We find this change of sound in French and in Italian. In the Latin part of our vocabulary there is naturally the same weakening; whereas, in words of English origin, the original guttural is generally preserved, even before *e* or *i*, as in *get* and *give*. Sometimes it has been weakened at the end of a word, as in *bridge* and *ridge*, which were originally *brigg* and *rigg*, and are still so in the north of England.

GABELENTZ, HANS CONON VON DER, a distinguished linguist and ethnologist, born at Altenburg, October 13, 1807, was the only son of Hans Karl Leopold von der Gabelentz, chancellor and privy-councilor of the Duchy of Altenburg. He died on his estate of Lemnitz, in Saxe-Weimar, on September 3, 1874. In the course of his life, he is said to have learned no fewer

than eighty languages, thirty of which he spoke with fluency and elegance. But he was less remarkable for his power of acquisition than for the higher talent which enabled him to turn his knowledge to the genuine advancement of linguistic science.

GABII, an old, and at one time important, city of Latium, on the Via Prænestina, or road to Præneste, between twelve and thirteen miles east of Rome.

GABLER, GEORG ANDRES, a German philosophical writer of the school of Hegel, was born at Altdorf, in Bavaria, where his father was professor, on July 30, 1786. He died at Teplitz, September 13, 1853.

GABLER, JOHANN PHILIPP, a learned Protestant theologian of the school of Griesbach and Eichhorn, was born at Frankfurt-on-the-Main, June 4, 1753, and died at Jena, February 17, 1826.

GABLONZ, the chief town of a circle in Bohemia, is situated in a hilly country on the river Neisse, about six and one-half miles southeast of Reichenberg.

GABOON RIVER, or RIO DE GABAO; called Ole Mpongwe by the Mpongwe natives, and Aboka by the Fan, is, in reality, not a river but an estuary on the west coast of Africa. It lies immediately north of the equator, disemboing in 0° 21' 25" N. latitude and 9° 21' 23" W. longitude. At the entrance, between Cape Joinville, or Santa Clara, on the north, and Cape Pangara, or Sandy Hook, on the south, it has a width of about eighteen miles. It maintains a breadth of about seven miles for a distance of forty miles inland, when it contracts into what is known more correctly as the Rio Olambo, which is not more than two or three miles from bank to bank. Two rivers, the Nkomo or Como, and the Mbokwa or Bokoe, discharge into the upper portion of the Rio Olambo.

GABRIEL is the name of the heavenly messenger (see ANGEL) who was sent to Daniel to explain the vision of the ram and the he-goat, and to communicate the prediction of the Seventy Weeks.

GAD in Hebrew and Chaldee means "luck." Gad is also the name of a "prophet" or "seer," who was probably a pupil of Samuel at Naïoth, and a companion of David, to whom he early attached himself.

GADÂMES, GHADÂMES, or RHADÂMES, the chief town of an oasis of the same name, in that part of the Sahara which belongs to the regency of Tripoli, not far from the frontier of Algeria.

GADARA, an ancient city of Syria, in the Decapolis, about six miles southeast of the Sea of Galilee, on the banks of the Hieromax.

GADDI. Four painters of the early Florentine school—father, son, and two grandsons—bore this name.

1. GADDO GADDI (1239 to about 1312) was, according to Vasari, an intimate friend of Cimabue, and afterward of Giotto. He was a painter and mosaist.

2. TADDEO GADDI (about 1300-1366, or later), son of Gaddo, was born in Florence, and became one of Giotto's most industrious assistants.

3. AGNOLO GADDI, born in Florence, was the son of Taddeo; the date of his birth has been given as 1326, but possibly 1350 is nearer the mark. He was a painter and mosaicist.

4. GIOVANNI GADDI, brother of Agnolo, was also a painter of promise. He died young.

GADIATCH, a town of Russia, at the head of a district in the government of Poltava, situated on the elevated banks of the Grun and the Psel, seventy-three miles north-northwest of Poltava. Population, 9,000.

GADSDEN, the county seat of Etowah county, Alabama, is situated on the west bank of the Coosa river, at the foot of a mountain range. It possesses first-class transportation facilities by rail and river, and since the development of the iron mines has become an important mining and manufacturing point. The industries include foundries, lumber and flouring mills, and wood-working mills. Cotton is shipped, and there is considerable trade. The population in 1900 (12th census) was 4,282.

GADWALL, a word of obscure origin, the common English name of the Duck, called by Linnæus *Anas strepera*, but considered by many modern ornithologists to require removal from the genus *Anas* to that of *Chaulelasmus* or *Ctenorhynchus*, of either of which it is not only the typical but the sole species.

GAELIC LANGUAGE AND LITERATURE. Until recently there was doubt as to the family of languages to which the Gaelic belonged; indeed, with many scholars the impression existed that it belonged to the Semitic branch, and that its relations must all be traced among some one or other of its varieties. This view arose very much from the neglect with which the language had been treated by scientific men. It is doubtful whether a higher class of scholarship has been nurtured anywhere than in the study of the Celtic languages.

The first who brought real scholarship to bear upon the question of the family to which the Celtic dialects belonged was Dr. Cowles Pritchard. His *Eastern Origin of the Celtic Nations* is a work of the highest value, distinguished by its erudition, and the sound judgment it displays. He was one of the most remarkable men whom Britain has produced in the field of comparative philology. No doubt it is with the Welsh he chiefly dealt, but, in discussing such questions as he had to deal with, it mattered little which of the Celtic tongues was made use of. Many writers followed Doctor Pritchard, and there is now, as has been said, no question about the Aryan source of the Celtic languages. It is not that the words are to a large extent analogous, but the grammatical structure and the idioms correspond to such an extent that the question is put beyond a doubt; while, with the exception of a few common vocables, there is little that is analogous between the Celtic and the Semitic languages.

The territory once occupied by the Celtic race is a question of much interest. Now they are confined within well-known limits. On the European continent they occupy that part of France usually called Brittany, the most westerly portion of the country terminating in Cape Finisterre. They occupied this territory so early as the days of Julius Cæsar, although it has been said that they were emigrants from Britain at a later period. The topographical terms given by Cæsar in describing the Roman invasion all indicate that the language of the natives of Brittany used then, and for a long time before, was as much Celtic as it is now. Opposite to Brittany lies British Cornwall, a region with a Celtic

tongue until about 100 years ago. The two Cornwalls—one in Britain and the other in France—terminated, one on each side, the territory occupied by the Celt. The dialects spoken in these stood in the closest relationship. To the north of this lies the greatest of all the modern sections of the Cimbrian Celts. Wales, occupied by about a million inhabitants, is nearly Celtic, and uses the ancient tongue of Wales and Cumbria, or Strathclyde. Across the sea from Wales lies the Isle of Man, where the Gaelic branch of the Celtic held sway, and does to some extent still. In Ireland the Gaelic also prevailed, and is still spoken by about a million people. And lastly, in the Scottish Highlands about 300,000 people still use, less or more, the old Gaelic tongue of Scotland. Thus Brittany, Wales, Isle of Man, western Ireland, and the Scottish Highlands are now the territory of the Celtic languages. That they once occupied a wider sphere is beyond a doubt. There are traces of the tongue, in one form or other, to be found all along southern Europe. Topography is a valuable source of evidence, and one that will be made to serve purposes it has never served as yet; and it furnishes us—in Italy, France, Switzerland, Spain, and Portugal—with relics which, like animal fossils dug from the depths of the earth, speak unmistakably of what formerly existed there. How far the Gaelic form of Celtic speech prevailed it is difficult to say, or whether it existed alongside of the Cimbric on the continent of Europe. But the name Gallia is significant as applied to France; and it is a suggestive fact that, to this day, the Bretons call France Gaul, as distinguished from their own country, and in like manner call the French language Gallic, as distinguished from the Breton. In Scotland the Gaelic and Cimbric races long dwelt together, distinct and yet nearly related. When they separated, either as to race or language, is not easily settled. There are indications on the Continent which rather throw doubt on the idea maintained by some writers that the divergence took place after the settlement of the race in Britain, and farther inquiry as to these indications is essential ere a satisfactory conclusion can be reached. But within the historic period the two races existed side by side in Scotland, the Cimbric occupying the region called Strathclyde, with their separate government and laws, and the Gael at least occupying the Dalriadic kingdom of Argyll. The people called by the Romans Picts occupied the north and east of Scotland. That these were the same people with the Dalriadic Scots is somewhat questionable. That they were closely related to them is beyond doubt, but that they had linguistic and other peculiarities is manifest. Their topography proves it, being different from that of either Ireland or Argyll, and, so far as the historic relations of both are concerned, they indicate a state of chronic war. For centuries there were mutual raids of Scots on Picts, and Picts on Scots, until finally, under Kenneth MacAlpine, king of Dalriada, the Picts were overcome in the year 843, and they and the Scots became united under one monarchy. The tradition is that the Picts were annihilated—meaning, in all likelihood, their power—and there arose one great united kingdom. The united people are the ancestors of the present Scottish Highlanders, and the Gaelic language has come down from them to us, influenced as to structure by the dialect spoken and written by the victors.

The Gaelic language, as now in use in Scotland, resembles closely in its structure both the Irish and the Manx. They form one family, and yet it has its own distinctive features. Irish scholars maintain that it is a modern and corrupt offshoot of the Irish, and account in this way for these peculiarities. They say, for ex-

ample, that the absence of the present tense in the Gaelic verb is a mere instance of decay, and proves the modern character of the dialect. But the Welsh is no modern and corrupt form of Irish, but an ancient, distinct tongue, so far back as history carries us. And yet it wants the present tense, indicating that this peculiarity is distinctive of some of the Celtic tongues, and that what is cited as a proof of recency may in reality be a proof of priority. The present tense may be called an Irish addition made to the verb in the process of culture. At the same time it must be allowed that there is a difficulty in proving from any literary remains existing, that the present Scottish form of the language is of great antiquity. All the literary relics that have come down to us are written in what is usually called the Irish dialect. The present tense is in universal use, as well by Scottish as by Irish writers. This arose from the identity of the Irish and Scottish churches. The dialect in which all theological treatises were written, was one, and this dialect extended from the clergy to bards, and sennachies, and medical men. There is not a page of Gaelic written in any other dialect before the middle of last century. But as in other countries, there was both a spoken and a written dialect in use; so in both Scotland and Ireland there appears to have been a dialect in use among the people as their common speech, and another used by their scholars—the former varying according to locality, and the latter being identical throughout.

GAELIC LITERATURE. The literature of the Scottish Highlands may be divided into several branches.

Mythology.—We have first the mythology of the race. Little of this now exists, and it is difficult to piece the scattered fragments together. We find the mythology of the older faith or faiths interwoven in some cases with the mythology of the Northmen. The mythology of the East appears at some points, and we have giants, fairies, and witches, some of them firmly believed in to the present day. Adamnan, in his life of Columba, refers to the magi who were in the palace of the Pictish king whom the missionary sought to convert. Who these were, and what was their creed, is not clearly stated, but all we read of that early faith, and all that tradition brings down to us, would seem to indicate that their worship was a form of sun worship. The words applied to the cardinal points of the compass convey this impression; the fear shown in many ways of going against the course of the sun, and certain festivals in which fire was and is used, would seem to confirm it. The bodies of the dead are in some cases carried sun-wise round certain objects on their way to the burial ground; in fact, words and practices crop up in several parts of the country serving to show that the sun was worshiped. *Rath*, a circle, is used in Gaelic to express good fortune:—*cha-n'eil rath air*, there is no circle on him,—he is not fortunate,—referring, no doubt, to the course of the sun. There was a Gaelic mythology connected with the Fingalian heroes. Whether they themselves were mythical or not is debated, but there was a mythology connected with them. Fingal had a sword that never required to be used twice; the Vulcan of the race could cross a glen with a stride; Manannan, son of Lir, from whom the Isle of Man is named, could clothe himself in a fog, and so hide himself from his enemy. The story of Diarmad and the boar, and the story of Fraoch and the beast, are mythological, the former being the Celtic story of Achilles, and the latter the Celtic version of the Garden of the Hesperides. Then there were giants called *Na Fiantaichean*, men of colossal mold. *Dun Fhian*, the giant's castle, is a common topographical term.

A collection of Gaelic proverbs was made, in the year

1819, by the Rev. Donald Mackintosh, and, to form some idea of the number of them, it is only necessary to observe that, under the letter "I" alone, they reach the number of 382 in the first edition of the book. A large number of these proverbial sayings escaped the notice of Mr. Mackintosh, and additions were made in the second edition, while some of the very best are not recorded even yet. Proverbial sayings in English are represented by sayings of a different kind in Gaelic, having the same meaning. "There is many a slip between the cup and the lip," is represented by *Is le duine an ni a shluigeas e, ach cha leis an ni a chagaineas e*, "What a man swallows is his own, but not what he chews." "It never rains but it pours" is represented by *An uair a theid a' chailleach 'n a ruith, theid i' n a deann-ruith*, "When the old woman takes to running, she runs with a will." "Sour grapes"—*Mionnan a' bhairdis a' chaisteal, cha tìd mi fhéin d'òn chaisteal bhreun, cha teid, cha leig iad ann mi*, "The bard's oath to the castle, 'I won't go to the vile castle now, they won't let me in.' " The Gaelic proverbs are full of interest, and add much to the power of either speech or writing when skillfully used.

Sgeulachdan, or, Tales of Fiction.—These at one time abounded in the Highlands, and had much in common with the tales collected and published by Grimm and Dasent, from the German and the Norse.

Clan History.—A portion of the literature of the Gaelic Celt consists of clan history. The clan system does not seem to be very ancient. In all probability it dates from the period when the Gaelic kingdom of Scotland ceased to exist. It has been already said to date from the era of charters. But the two eras are pretty nearly identical. Down to the reign of Malcolm III. the Gaelic kingdom appears to have been to a large extent homogeneous. There were no elements in it but what were Celtic, as it never really embraced within it the Scandinavian sections.

MS. Literature.—The written Gaelic literature was at its earlier period so mixed up with that of Ireland that it is not easy in every instance to distinguish them. The early church of both countries was one, and the early literature was the offspring of the early church. The very first notices we have of the church, whether among the mission institutes of Ireland or Iona, indicate the existence and extensive cultivation of a native literature. The transcription or translation of portions of the Scriptures is shown to have been one of the frequent exercises of the early missionaries, and they all learned to write the same dialect, and make use of the same letters. Many of the MSS., written in Iona, may be credited to Ireland, and *vice versa*; and writings found in Continental libraries may be presumed to have been the work of Scottish, as truly as of Irish, writers. The early treatises, and glosses upon Latin treatises, on theological and other subjects, still existing in the early Gaelic dialect, are numerous, and have afforded materials for the acute and masterly criticism of Zeuss, De Nigra, Stokes, and others; and these are accompanied by treatises on grammar, history, medicine, astrology, metaphysics, poetry, and similar subjects, which are of much interest. Most of these remains are found in the collections in Trinity College, Dublin, and in the library of the Irish Royal Academy; but there are numerous remains in the Edinburgh Advocate's Library, which prove at least that there were in Scotland persons who valued and collected this literature. There can be no doubt that there were many contributions to it as well.

The nineteenth century has seen many large contributions to the literature of the Gaelic Celt. It has shared in the general progress of learning, and with this it has risen in the estimation of the scholars of Europe.

Grammars and dictionaries have been compiled; magazines of various kinds have been started and carried on for a time with much vigor; collections, such as Mackenzie's *Beauties of Gaelic Poetry*, have been made; and such provisions have been laid up for the future as to secure an ample supply of materials for the scholars of a coming age. That appears to be the special work laid upon the scholars of the present time. They have to collect materials and commit them to writing, and to describe the peculiarities that are distinctive of a living language, for the use of those who hereafter can only study it as existing in books, where emphasis, and tone, and accent are altogether unknown, and where the comments and expositions of living men, familiar with the language and the literature from their childhood, are altogether wanting. For that the Gaelic language is in a state of decay is manifest to the most ordinary observer. And the decay is two-fold, being both within and without. Within, the vocabulary is waning, and English words are coming into use. Gaelic idioms are in like manner disappearing, and English idioms replacing them; while from without, under the influence of education, immigration, steamboats, railways and other modern devices, English is rapidly finding its way into the land, and pushing the ancient tongue out of it. When this process is completed, a change will befall the people, too, for there is no doubt that there is a close relation between the character of a language and the character of the people who use it; so that, when the Gaelic disappears, many of the features distinctive of the Highland character will disappear along with it. In some respects this will be cause of regret; in others perhaps it will not.

GAETA, at one time the "Gibraltar of Italy," a strongly-fortified seaport town in the province of Caserta, at the extremity of a peninsula forming the north-west boundary of the Gulf of Gaeta, with a station on the railway forty miles northwest of Naples.

GÆTULIA, or the land of the Gætuli, an ancient district of somewhat uncertain limits in northern Africa. It may be roughly said to have been bounded on the north by Mauretania and Numidia, east by the country of the Garamantes, south by the basin of the Niger, and west by the Atlantic; but the frontiers must have been of a very uncertain and shifting character.

GAGE, THOMAS, governor of Massachusetts, second son of the first Viscount Gage, was born in England in 1720. He entered the army at an early age, became lieutenant-colonel of the forty-fourth regiment of foot in 1750, was made major-general and governor of Montreal in 1761, and in 1763 succeeded Amherst in the command of the British forces in America. In 1774 he was appointed governor of Massachusetts, and in that capacity was intrusted with carrying into effect the Boston Port Act. In this political crisis, by his hesitancy in adopting measures against the leaders of the insurrectionary party, and contenting himself with fortifying Boston, he enabled the Americans to mature their plans in comparative security. The battle at Lexington, in which a detachment sent by him, on April 18, 1775, to destroy the cannon and ammunition at Concord was defeated, inaugurated the American revolutionary war. On June 12th he proclaimed martial law, and proscribed Samuel Adams and John Hancock, offering pardon to all the other rebels who should return to their allegiance; but the result of these measures was at once to exasperate and encourage the Americans. Although Gage gained the nominal victory of Bunker's Hill (June 17th), he was unable to raise the siege of Boston; and being shortly afterward superseded by General Howe, he sailed for England. He died in 1787.

GAGERN, HANS CHRISTOPH ERNST, BARON VON, a German statesman and political writer, was born at Kleinniederheim, near Worms, January 25, 1766. He retired from public life in 1848, and died at Hornau, October 22, 1852. Three of the sons of Baron Gagern have attained considerable eminence—one as a soldier, and two as politicians.

GAILLAC, the capital of an arrondissement in the department of Tarn, France, is situated on the right bank of the Tarn, twelve miles west of Albi.

GAILLARD, GABRIEL HENRI, a French historian, was born at Ostel, Picardy, in 1726. He died at St. Firmin, near Chantilly, February 13, 1806.

GAINES' MILL, a hamlet in Virginia, in Hanover county, noted as the scene of a bloody battle between the Federal and Confederate troops, during the efforts to capture Richmond by the former, under McClellan, June 27, 1862. The Confederates were commanded by General Lee, and the result of the battle was a Federal defeat.

GAINSVILLE, the county seat of Cooke county, Texas, is a flourishing city of 7,874 inhabitants. It has considerable trade in stock, contains three national banks and three newspaper offices, and manufactures of carriages, flour, furniture, &c.

GAINSBOROUGH, a market-town and port of Lincolnshire, is situated on the right bank of the Trent, twenty-one miles above its junction with the estuary of the Humber, and sixteen miles northwest of Lincoln.

GAINSBOROUGH, THOMAS, a painter famous for the truth and elegance of his portraits, and for the simple beauty of his landscapes, was born at Sudbury, Suffolk, in the year 1727. At ten years old, Gainsborough had sketched every fine tree and picturesque cottage near Sudbury, and at fifteen, having filled his task-books with caricatures of his schoolmaster, forged his father's handwriting to get a holiday, and sketched the portrait of a man whom he had detected in the act of robbing his father's orchard, he was allowed to follow the bent of his genius in London, under such advantages as Hayman, the historical painter, and the academy in St. Martin's Lane, could afford. Three years of study in the metropolis were succeeded by two years of idleness in the country.

Gainsborough had not been many months in London ere he received a summons to the palace, and to the end of his career he divided with West the favor of the court, and with Reynolds the favor of the town. In February, 1788, while witnessing the trial of Warren Hastings, he felt an extraordinary chill at the back of his neck; this was the beginning of a cancer (or, as some say, a malignant wen) which proved fatal on August 2d of the same year.

Gainsborough and Reynolds rank side by side as the greatest portrait painters of the English school.

GAISSIN, GAICYN, or HAISCIN, a town of Russia, at the head of a district in Podolia, 178 miles east of Kamenetz Podolski or Podoliau Kamenetz, near the river Sopa, a tributary of the Bug.

GAIUS, a celebrated Roman jurist. Of his personal history very little is known. It is impossible to discover even his full name, Gaius or Caius being merely a personal name (prænomen) very common in Rome. From internal evidence in his works it may be gathered that he flourished in the reigns of the emperors Hadrian, Antoninus Pius, Marcus Aurelius, and Commodus.

GALABAT, GALLABAT, or METEMME, a town in the frontier district of Egypt and Abyssinia, near one of the western sub-tributaries of the Atbara, about 100 miles west of Gondar. Population, 20,000.

GALANGAL, formerly written "galingale," and

sometimes "gariagal," *rhizoma galangæ* (German, *Galgantwursel*; French, *Racine de Galanga*), is an aromatic stimulant drug. Lesser galangal root *radix galangæ minoris*, the ordinary galanga of commerce, is the dried rhizome of *Alpinia officinarum*. Hance, a plant of the natural order *Zingiberacæ*, growing in the Chinese island of Hainan, where it is cultivated, and probably also in the woods of the southern provinces of China.

GALAPAGOS ISLANDS, an archipelago of five larger and ten smaller islands, situated in the Pacific Ocean exactly under the equator, about 500 or 600 miles west of Ecuador. The total area is estimated at 2,250 square miles.

The extraordinary number of craters, a few of them still active, "in size from mere spiracles to huge caldrons several miles in circumference," to be found throughout the islands, gives evidence that the archipelago has been the result of volcanic action. Three of the islands are used as penal colonies by the Ecuadorian government.

Though the islands are under the equator, the climate is not intensely hot, as it is tempered by cold currents from the Antarctic Sea.

GALASHIELS, a parliamentary burgh and manufacturing town of Scotland, built on both sides of the river Gala, about a mile above its confluence with the Tweed, and thirty-three miles south of Edinburgh.

GALATIA, afterward called also **GALLO-GRÆCIA**, in ancient geography an inland division of Asia Minor, bounded on the north by Bithynia and Paphlagonia, east by Pontus, south by Cappadocia and Lycaonia, west by Phrygia.

GALATIANS, EPISTLE TO THE. Although "Galatia," as a united kingdom under Amyntas, included Pisidia, as well as portions of Lycaonia and Pamphylia, and when constituted a Roman province was further enlarged so that it extended from Taurus to the Euxine, it is safe to assume that the persons to whom the Pauline epistle was addressed were inhabitants of Gallo-græcia, the old name for Eastern Gaul.

GALATINA, a town of Italy, in the province and circondario of Lecce, on the road from Otranto to Taranto.

GALATZ, or **GALACZ**, a town and port of Roumania, principality of Moldavia, chief town of the district of Covurlin, on the left bank of the Danube (there 2,000 feet wide), between the mouths of the Pruth and Sereth, about eighty-five miles from the Sulina mouth of the Danube, and 130 miles northeast of Bucharest, with which it is connected by rail. Pop. (1900), 62,678.

GALBA, SERVIUS SULPICIUS, a Roman emperor. He came of a noble family, being born 3 B.C. and sixth in direct descent from the great orator of the same name, though unconnected either by birth or adoption with the line of the first six Cæsars. He owed his elevation to the growing power of the prætorians and the discontent of the provincials, weary of Nero's rule, and beginning to assert their independence. For the first half of Nero's reign he lived in retirement, till, in sixty-one, the emperor bestowed on him the province of Hispania Tarraconensis.

The first years of his rule were marked by rigorous discipline and strict justice, which sometimes degenerated into cruelty. It is true that during the later period of his administration he was indolent and apathetic, whether it was that he sought to elude the jealousy of Nero, or, as is more probable, felt the growing infirmities of age. Yet his career, taken as a whole, shows the justice of the common judgment, as reported by Tacitus, that all would have pronounced him fit for empire had he not been emperor indeed. In the spring of

68, Galba was holding an assembly at New Carthage when the news reached him of the insurrection in Gaul. The appeal of Vindex, urging him to assume the championship of the oppressed human race, placed Galba in an awkward dilemma, and his decision was prompted not so much by ambition as by fear of Nero, whom he knew to be plotting his death. The fall and suicide of Vindex renewed his hesitation, when the news that Nymphidius Sabinus, the prefect of the prætorians, had declared in his favor, and by large promises in his name carried the troops with him, revived his spirits. Before, he had only dared to call himself the minister of the senate and Roman people; he now assumed the title of Cæsar, and marched straight for Rome. At first he was welcomed by the senate and the party of order, but he was never popular with the soldiers or the people, and he soon forfeited the regard even of his few supporters. He was ruined by his virtues no less than by his vices. He was assassinated by a slave 69 A.D.

GALBANUM, a gum-resin, believed to be the product of *Ferula galbaniflua*, Boiss. et. Buhse, and *F. rubricaulis*, Boiss., indigenous to Persia, and perhaps also of other umbelliferous plants. It occurs usually in hard or soft, irregular, more or less translucent and shining lumps, composed of agglutinated drops or tears, or occasionally in separate tears, and is of a light-brown, yellowish, or greenish-yellow color, and has a disagreeable bitter taste, a peculiar, somewhat musky odor, and a specific gravity of 1.212. It is administered medicinally for its antispasmodic, expectorant, and stimulant properties. As an antispasmodic it is considered inferior to asafoetida, but superior to ammoniacum, which, however, is more efficacious as an expectorant in asthma.

GALE, THEOPHILUS, a distinguished divine, was born in 1628 at King's Teignmouth, in Devonshire, of which place his father was vicar. He died in 1678.

GALE, THOMAS, an eminent classical scholar, was born at Scruton, Yorkshire, in 1636. He was educated at Westminster School and at Trinity College, Cambridge, of which he became a fellow. In 1666 he was appointed regius professor of Greek, in 1672 headmaster of St. Paul's School, in 1676 a fellow of the Royal Society, and also prebendary of St. Paul's, and in 1697 dean of York. He died at York in 1702.

GALEN, CHRISTOPH BERNHARD VAN, prince-bishop of Münster, was descended from a noble family in Westphalia, and was born October 15, 1600. After attending the Jesuit college at Münster, and the universities of Cologne, Mainz, Louvain, and Bordeaux, he was engaged in several diplomatic missions. Subsequently he became colonel in the army of the elector Ferdinand of Bavaria, and took part in campaigns against the French and Swiss. On the death of Ferdinand he was chosen prince-bishop of Münster. In 1664 he was chosen, along with the margrave Frederick of Baden, joint administrator of military affairs of the Rhenish alliance in its war against the Turks. After the peace that followed the victory of St. Gotthard, he concluded an alliance with Charles II. of England against the Netherlands. In 1672, in conjunction with France, Galen renewed hostilities against the Netherlands. In the following year he entered into an alliance with the king of Denmark and the elector of Brandenburg against Charles XI. of Sweden. Subsequently he became involved in a war with East Friesland, and only consented to evacuate that territory on payment of a large sum of money. He died at Ahaus, September 19, 1678.

GALEN, or **GALENUS, CLAUDIUS**, called Gallien by Chaucer and other writers of the Middle Ages, the most celebrated of ancient medical writers, was born at Pergamus, in Mysia, about 130 A.D. His father Nicon, from whom he received his early education, is described

as remarkable both for excellence of natural disposition, and for mental culture; his mother, on the other hand, appears to have been a second Xanthippe. In 146 Galen commenced the study of medicine, and in about his twentieth year he left Pergamus for Smyrna, in order to place himself under the instruction of the anatomist and physician Pelops, and of the peripatetic philosopher Albinus. He subsequently visited other cities, and in 158 returned from Alexandria to Pergamus. In 164 he went for the first time to Rome. In Rome Galen remained for some years, greatly extending his reputation as a physician, and writing some of his most important treatises. It would appear that he eventually betook himself to Pergamus, after spending some time at the island of Lemnos, where he learned the method of preparing a certain popular medicine, the "terra lennia," or "sigillata." Whether he ever revisited Rome is uncertain, as also are the time and place of his death. According to Suidas, he died at the age of seventy, or in the year 200, in the reign of Septimius Severus. If, however, we are to trust the testimony of Abul-faraj, one of his Arabian biographers, his decease took place in Sicily, when he was in his eightieth year.

GALENA, or **LEAD-GLANCE**, a mineral which is essentially a sulphuret of lead, the proportions being 13.3 sulphur and 86.7 lead; but usually containing a little silver, and sometimes copper, zinc, antimony, or selenium. It is of a lead-gray color, with a metallic luster, is found massive, or sometimes granular, or crystallized, in cubes or octahedrons. It is very easily broken, and its fragments are cubical. It occurs in veins, beds, and imbedded masses, often accompanying other metallic ores, in primitive and secondary rocks, but most of all in what is known as transition or mountain limestone. It is found abundantly in Northwestern Illinois, Southwestern Wisconsin, and elsewhere.

GALENA, the county seat of Jo Daviess county, Ill., lying on the Galena river. It is surrounded by lead mines, and is of considerable importance as a trade center. It has railroad, banking and telegraph facilities, and a population of 5,005 (census 1900). It was the home of Gen. U. S. Grant at the beginning of the Civil War. A monument to Gen. Grant was erected there in the public park in May, 1891.

GALESBURG, the county seat of Knox county, Ill., is an important railroad center. It has a large trade with the contiguous district, and is the seat of two colleges and several other educational institutions. Its banking and telegraph facilities are ample, and its population (1900) numbers 18,607. It has extensive manufactories of wagons and agricultural implements, and large railroad machine shops.

GALIANI, **FERDINANDO**, one of the most celebrated, if not one of the soundest, political economists of Italy, was born at Chieti on December 2, 1728. Galiani gave early promise of distinction as an economist, and even more as a wit. At the age of twenty-two he had produced two works by which his name became widely known far beyond the bounds of his own Naples. His taste for economic studies had been developed in the society of such men as Genovesi and Intieri, and prompted the composition of his *Trattato della Moneta*, in which many aspects of the question of exchange are set forth, always with a special reference to the state of confusion then presented by the whole monetary system of the Neapolitan government. Galiani's fame as a humorist dated from the appearance of the *Raccolta in Morte del Boia*. He died October 30, 1787.

GALICIA, in German *Galizien*, and in Polish *Halicz*, a crown-land of Austria which comprises the old kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand-duchy of Cracow.

About a third of the whole area of Galicia is occupied by the Carpathians, and the greater proportion of the remainder consists of the terraces by which the mountain system gradually sinks down to the great eastern plains of Russia. Only a very small district near the Vistula can properly be described as lowland. The two most prominent summits of the Galician Carpathians are the Babia Gora or Women's Mountain, 5,648 feet above the level of the sea, and the Waxmundska, 7,189. Of the famous massif of the Tatra, hardly a fourth is within the Galician boundaries.

By its rivers Galicia belongs partly to the basin of the Baltic and partly to the basin of the Black Sea. The Dunajec, the San, and the Premsza, tributaries of the Vistula, are the navigable streams of the western region, and the Dniester, which is the principal river of the east, is navigable as far as Czartoria. There are few lakes in the country except mountain tarns; but considerable morasses exist about the Upper Dniester, the Vistula, and the San, and the ponds or dams in the Podolian valleys are estimated to cover an area of 208 square miles. Of the thirty-five mineral springs which can be counted in Galicia, the most frequented are Konopowka, south of Tarnopol, and Lubian and Sklo, west of Lemberg. The last is a good example of the intermittent class. The population (1901) was 7,315,816.

GALICIA (*Gallæcia* or *Callæcia*), an ancient kingdom, countship, or province in the northwest angle of Spain, now divided into the provinces of Coruña, Lugo, Orense and Pontevedra.

GALILEE, the most northerly of the three provinces into which Palestine was at the Roman period divided, was bounded on the east by the Jordan, on the south by Samaria, on the west by the Mediterranean, on the northwest by Phœnicia and on the north by the Leontes, the extreme length being about sixty miles, the extreme breadth thirty, and the area one thousand square miles. The Galilee thus defined, however, though doubtless the Galilee of Herod's tetrarchy and of later centuries, was hardly that of ordinary parlance at the beginning of the Christian era. Josephus himself, while substantially giving these boundaries, yet incidentally in one place speaks of Upper Galilee as constituting the whole of Galilee proper, and elsewhere in giving Xaloth and Dabaratta as boundary towns, seems to exclude from Galilee the plain of Esdraelon.

The population of Galilee is mixed. In Lower Galilee the peasants are principally Moslem, with a sprinkling of Greek Christians round Nazareth, which is a Christian town. In Upper Galilee, however, there is a mixture of Jews and Maronites, Druses and Moslems (natives or Algerine settlers), while the slopes above the Jordan are inhabited by wandering Arabs. The Jews are engaged in trade, and the Christians, Druses and Moslems in agriculture; and the Arabs are an entirely pastoral people.

The antiquities of Galilee include cromlechs and rude stone monuments, rock-cut tombs, and wine-presses, with numerous remains of Byzantine monasteries and fine churches of the time of the crusades. There are also remains of Greek architecture in various places, but the most interesting buildings are the ancient synagogues. These have not been found in other parts of Palestine, but in Galilee eleven examples are now known. They are rectangular, with the door to the south, and three rows of columns forming four aisles east and west. The architecture is a peculiar and debased imitation of classic style, attributed by architects to the second century of our era. The builder of the examples at Kefr Birim, el Jish, and Meirûn is known to have been the famous Simeon bar Jochai, who lived about 150 A.D., and built twenty-four synagogues in Galilee. The similarity of

style renders it probable that the other examples at Tell Hüm, Kerāzeh, Nebartein, Umm el 'Amed, and Sufsāf were also his work. Both at el Jish and at Kefr Birim there are two synagogues, large and small. At Irbid, above Tiberias, is another synagogue of rather different character, which is said to have been built by Rabbi Nītai. Traces of synagogues have also been found on Carmel, and at Tīreh, west of Nazareth. It is curious to find the representation of various animals in relief on the lintels of these buildings. Hebrew inscriptions also occur, and the carved work of the cornices and capitals is very rich. These synagogues were erected at a time when the Galilean Jews were flourishing under the Roman empire, and when Tiberias was the central seat of Jewish learning and of the Sanhedrin.

GALILEE, THE SEA OF, with its surrounding shores, deserves a more special description than that given of the rest of the district, as being the part of Palestine which most interests modern students and travelers. The lake was also called the Sea of Chinnereth or Chinneroth, and the Lake of Gennesaret or Tiberias; and by Pliny it is said to have been once called Lake of Taricheæ. In form it is pear-shaped, twelve and a half English miles in length, and seven and a half at its greatest width. The level is now known to be 682.5 feet below the Mediterranean. The water is fresh and clear, and large shoals of fish abound in it. The formation of the lake basin occurred later than the Chalk period, and was due to a subsidence of the strata, which appears to have been sudden and violent, and probably accompanied by extensive volcanic eruptions from three centers east, west and north of the lake. The district has always been liable to volcanic disturbance and to earthquakes. In 1837 Safed and Tiberias were destroyed by earthquake, and the temperature of the hot springs round the lake was then observed to rise considerably for a time.

The Sea of Galilee is best seen from the top of the western precipices, and presents a desolate appearance. On the north the hills rise gradually from the shore, which is fringed with oleander bushes and indented with small bays. The ground is here covered with black basalt. On the west the plateau of el Ahma terminates in precipices 1,700 feet above the lake, and over these the black rocky tops called "the Horns of Hattin" are conspicuous objects. On the south is a broad valley through which the Jordan flows. On the east are furrowed and rugged slopes, rising to the great plateau of the Jaulān (Gaulonitis). The Jordan enters the lake through a narrow gorge between lower hills. A marshy plain, two and a half miles long and one and a half broad, called el Batihah, exists immediately east of the Jordan inlet. There is also on the west side of the lake a small plain called el Ghuweir, formed by the junction of three large valleys. It measures three and a quarter miles along the shore, and is one mile wide. This plain, naturally fertile, but now almost uncultivated, is recognized to be the plain of Gennesareth, described by Josephus. The shores of the lake are of fine shingle. On the east the hills approach in one place within forty feet of the water, but there is generally a width of about three-quarters of a mile from the hills to the beach. On the west the flat ground at the foot of the hills has an average width of about two hundred yards. A few scattered palms dot the western shores, and a palm grove is to be found near Kefr Hārib on the southeast. Thermal springs are found on each side of the lake, with an average temperature of about 80° Fahr. The hot baths south of Tiberias include seven springs, the largest of which has a temperature of 137° Fahr. The plain of Gennesareth, with its environs, is the best

watered part of the lake-basin. North of this plain are the five springs of el Tābhghah, the largest of which was inclosed about a century ago by Aly, son of Dhahr el 'Amr, in an octagonal reservoir, and the water led off by an aqueduct fifty-two feet above the lake. The Tābhghah springs, though abundant, are warm and brackish. At the north end of the plain is 'Ain el Tīneh ("spring of the fig-tree"), also a brackish spring with a good stream; south of the plain is 'Ain el Bārdeh ("the cold spring"), which is sweet, but scarcely lower in temperature than the others. The most important spring remains still to be noticed, namely, 'Ain el Madāwerah ("the round spring"), situated one mile from the south end of the plain and half a mile from the shore. The water rises in a circular well thirty-two feet in diameter, and is clear and sweet, with a temperature of 73° Fahr. The bottom is of loose sand, and the fish called coracinus by Josephus is here found in abundance. Doctor Tristram was the first explorer to identify this fish, and points out that it could not exist in the other springs. We are thus able to identify the "round spring" with the fountain of Capharnaum, which, according to Josephus, watered the plain of Gennesareth.

GALILEO. Galileo Galilei, one of the earliest and greatest of experimental philosophers, was born at Pisa, February 18, 1564. From his earliest childhood Galileo was remarkable for intellectual aptitude, as well as for mechanical invention. His favorite pastime was the construction of toy machines, not the less original and ingenious that their successful working was usually much hindered by the scarcity of suitable materials. His application to literary studies was equally conspicuous. In the monastery of Vallombrosa, near Florence, where his education was principally conducted, he not only made himself acquainted with the best Latin authors, but acquired a fair command of the Greek tongue, thus laying the foundation of the brilliant and elegant style for which his writings were afterward distinguished. From one of the monks he also received instruction in logic, according to the system then in vogue; but the futilities of the science revolted, while its subtleties failed to interest his understanding, and he was soon permitted to abandon a study so distasteful to him. A document published by M. Selmi in 1864 proves that he was at this time so far attracted toward a religious life as to have joined the novitiate of the order; but his father, who had other designs for him, seized the opportunity of an attack of ophthalmia to withdraw him permanently from the care of the monks. Having had personal experience of the unremunerative character both of music and of mathematics, he desired that his son should apply himself to the more profitable study of medicine, and, not without some straining of his slender resources, placed him, before he had completed his eighteenth year, at the university of Pisa. He accordingly matriculated, November 5, 1581, and immediately entered upon attendance at the lectures of the celebrated physician and botanist, Andrea Cesalpino.

The natural gifts of the young student, not less multifarious than those of an earlier Tuscan prodigy, Leonardo da Vinci, seemed at this time equally ready to develop in any direction toward which choice or hazard might incline them. In musical skill and invention he already vied with the best professors of the art in Italy; his personal taste would have led him to choose painting as his profession, and one of the most eminent artists of his day, Lodovico Cigoli, owned that to his judgment and counsel he was mainly indebted for the success of his works; his wit and eloquence gave promise that he would one day add to the literary glories of his country; while his mathematical

and mechanical genius only awaited a suitable opportunity for full display and development. In 1583, while watching the vibrations of the great bronze lamp still to be seen swinging from the roof of the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were invariably executed in equal times. The experimental verification of this fact led him to the important discovery of the isochronism of the pendulum. He at first applied the new principle to pulse-measurement, and more than fifty years later turned it to account in the construction of an astronomical clock. Up to this time he was entirely ignorant of mathematics, his father having carefully held him aloof from a study which he rightly apprehended would lead to his total alienation from that of medicine. Accident, however, frustrated this purpose. A lesson in geometry, given by Ostilio Ricci to the pages of the grand-ducal court, then temporarily resident at Pisa, chanced to have Galileo for an unseen listener; his attention was riveted, his dormant genius was roused, and he threw all his energies into the new pursuit thus unexpectedly presented to him. With Ricci's assistance, he rapidly mastered the elements of the science, and eventually extorted his father's reluctant permission to exchange Hippocrates and Galen for Euclid and Archimedes. In 1586 he was withdrawn from the university, through lack of means, before he had taken a degree, and returned to Florence, where his family habitually resided. We next hear of him as lecturing before the Florentine Academy on the site and dimensions of Dante's *Inferno*; and he shortly afterward published an essay descriptive of his invention of the hydrostatic balance, which rapidly made his name known throughout Italy. His first patron was the Marchese Guidubaldo del Monte of Pesaro, a man eminent for his scientific attainments, as well as influential by his family connections. At his request he wrote, in 1588, a treatise on the center of gravity in solids, which obtained for him, together with the title of "the Archimedes of his time," the honorable though not lucrative post of mathematical lecturer at the Pisan university. During the ensuing two years (1589-91) he carried on that remarkable series of experiments, by which he established the first principles of dynamical science, and by which he earned for himself the undying hostility of the bigoted Aristotelians of that day. From the leaning tower of Pisa he afforded to all the professors and students of the university ocular demonstration of the falsehood of the Peripatetic dictum that heavy bodies fall with velocities proportional to their weights, and with unanswerable logic demolished all the time-honored maxims of the schools regarding the motion of projectiles, and elemental weight or levity. But while he convinced, he failed to conciliate his adversaries. The keen sarcasm of his polished rhetoric was not calculated to soothe the susceptibilities of men already smarting under the deprivation of their most cherished illusions. He seems, in addition, to have compromised his position with the grand-ducal family by the imprudent candor with which he condemned a machine for clearing the port of Leghorn, invented by Giovanni de' Medici, an illegitimate son of Cosmo I. Princely favor being withdrawn, private rancor was free to show itself. He was publicly hissed at his lecture, and found it prudent to resign his professorship and withdraw to Florence in 1591. Through the death of his father in July of that year family cares and responsibilities devolved upon him as eldest son, and thus his nomination to the chair of mathematics at the university of Padua, secured by the influence of the Marchese Guidubaldo with the Venetian senate, was welcome, as affording a relief from pecuniary embar-

assment, no less than as opening a field for scientific distinction.

His residence at Padua, which extended over a period of eighteen years, from 1592 to 1610, was a course of uninterrupted prosperity. His appointment was three times renewed, on each occasion with expressions of the highest esteem on the part of the governing body, and his yearly salary was progressively raised from 180 to 1,000 florins. His lectures were attended by persons of the highest distinction from all parts of Europe, and such was the charm of his demonstrations that a hall capable of containing 2,000 people had eventually to be assigned for the accommodation of the overflowing audiences which they attracted. His ingenious invention of the proportional compasses—an instrument still used in geometrical drawing—dates from 1597; and about the same time he constructed the first thermometer, consisting of a bulb and tube filled with air and water, and terminating in a vessel of water. In this instrument, the results of varying atmospheric pressure were not distinguishable from the expansive and contractive effects of heat and cold, and it became an efficient measure of temperature only when Rinieri, in 1646, introduced the improvement of hermetically sealing the liquid in glass. The substitution, in 1670, of mercury for water completed the modern thermometer.

Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, and was deterred from avowing his opinions—as is proved by his letter to Kepler of August 4, 1597—by the fear of ridicule rather than of persecution. The appearance, in September, 1604, of a new star in the constellation Serpentarius, afforded him indeed an opportunity, of which he eagerly availed himself, for making an onslaught upon the Aristotelian axiom of the incorruptibility of the heavens; but he continued to conform his public teachings in the main to Ptolemaic principles, until the discovery of a novel and potent implement of research placed at his command startling and hitherto unsuspected evidence as to the constitution and mutual relations of the heavenly bodies. Galileo was not the original inventor of the telescope. That honor must be assigned to Hans Lippershey, an obscure optician of Middleburg, who, on October 21, 1608, offered to the states of Holland three instruments by which the apparent size of remote objects was increased. But here his glory ends, and that of Galileo begins. The rumor of the new invention, which reached Venice in April or May, 1609, was sufficient to set the Italian philosopher on the track; and after one night's profound meditation on the principles of refraction, he succeeded in producing a telescope of threefold magnifying power. Upon this first attempt he rapidly improved, until he attained to a power of thirty-two, and his instruments, of which he manufactured hundreds with his own hands, were soon in request in every part of Europe. Two lenses only—a plano-convex and a plano-concave—were needed for the composition of each, and this simple principle is that still employed in the construction of opera-glasses. Galileo's direction of his new instrument to the heavens formed an era in the history of astronomy. Discoveries followed upon it with astounding rapidity and bewildering variety. The *Sidereus Nuncius*, published at Venice in the early part of 1610, contained the first fruits of the new mode of investigation, which were sufficient to startle and surprise the learned on both sides of the Alps. The mountainous configuration of the moon's surface was there first described, and the so-called "phosphorescence" of the dark portion of our satellite attributed to its true cause—namely, illumination by sun-light reflected from the earth. All the time-worn fables and conjectures regarding the compo-

sition of the Milky Way were at once dissipated by the simple statement that to the eye, reinforced by the telescope, it appeared as a congeries of lesser stars, while the great nebulae were equally declared to be resolvable into similar elements. But the discovery which was at once perceived to be most important in itself, and most revolutionary in its effects, was that of Jupiter's satellites, first seen by Galileo January 7, 1610, and by him named *Sidera Medicea*, in honor of the grand-duke of Tuscany, Cosmo II., who had been his pupil, and was about to become his employer. An illustration is, with the general run of mankind, more powerful to convince than an argument; and the cogency of the visible plea for the Copernican theory offered by the miniature system, then for the first time disclosed to view, was recognizable in the triumph of its advocates, as well as in the increased acrimony of its opponents.

In September, 1610, Galileo finally abandoned Padua for Florence. His researches with the telescope had been rewarded by the Venetian senate with the appointment for life to his professorship, at an unprecedentedly high salary. His discovery of the "Medicean Stars" was acknowledged by his nomination (July 12, 1610) as philosopher and mathematician extraordinary to the grand-duke of Tuscany. The emoluments of this office, which involved no duties save that of continuing his scientific labors, were fixed at 1,000 scudi; and it was the desire of increased leisure, rather than the promptings of local patriotism, which induced him to accept an offer, the first suggestion of which had indeed come from himself. Before the close of 1610 the memorable cycle of discoveries begun in the previous year was completed by the observation of the ansated or, as it appeared to Galileo, triple form of Saturn (the ring-formation was first recognized by Huygens in 1655), of the phases of Venus, and of the spots upon the sun. Although his priority in several of these discoveries has been contested, inquiry has in each case proved favorable to his claims. In the spring of 1611 he visited Rome, and exhibited in the gardens of the Quirinal Palace the telescopic wonders of the heavens to the most eminent personages at the pontifical court. Encouraged by the flattering reception accorded to him, he ventured, in his *Letters on the Solar Spots*, printed at Rome in 1613, to take up a more decided position toward that doctrine on the establishment of which, as he avowed in a letter to Belisario Vinta, secretary to the grand-duke, "all his life and being henceforward depended." Even in the time of Copernicus some well-meaning persons had suspected a discrepancy between the new view of the solar system and certain passages of Scripture — a suspicion strengthened by the anti-Christian inferences drawn from it by Giordano Bruno; but the question was never formally debated until Galileo's brilliant discoveries, enhanced by his formidable dialectic and enthusiastic zeal, irresistibly challenged for it the attention of the authorities. Although he earnestly deprecated the raising of the theological issue, and desired nothing better than permission to pursue unmolested his physical demonstrations, it must be admitted that, the discussion once set on foot, he threw himself into it with characteristic impetuosity, and thus helped to precipitate a decision which it was his ardent wish to avert. In December, 1613, a Benedictine monk named Benedetto Castelli, at that time professor of mathematics at the university of Pisa, wrote to inform Galileo of a recent discussion at the grand-ducal table, in which he had been called upon to defend the Copernican doctrine against theological objections. This task Castelli, who was a steady friend and disciple of the Tuscan astronomer, seems to have discharged with moderation and success. Galileo's answer, written, as he said himself, *currente calamo*, was

an exposition of a formal theory as to the relations of physical science to Holy Writ, still further developed in an elaborate apology addressed by him in the following year (1614) to Christina of Lorraine, dowager grand-duchess of Tuscany. Not satisfied with explaining adverse texts, he met his opponents with unwise audacity on their own ground, and endeavored to produce scriptural confirmation of a system which to the ignorant many seemed an incredible paradox, and to the scientific few was a beautiful but daring innovation. The rising agitation on the subject which, originating probably with the sincere upholders of the integrity of Scripture, was fomented for their own purposes by the rabid Aristotelians of the schools, was heightened rather than allayed by these manifestoes, and on the fourth Sunday of the following Advent found a voice in the pulpit of Santa Maria Novella. Padre Caccini's denunciation of the new astronomy was indeed disavowed and strongly condemned by his superiors; nevertheless, on February 5, 1615, another Dominican monk named Lorini laid Galileo's letter to Castelli before the Inquisition.

Cardinal Robert Bellarmine was at that time by far the most influential member of the Sacred College. He was a man of vast learning and upright piety; but, although personally friendly to Galileo, there is no doubt that he saw in his scientific teachings a danger to religion. The year 1615 seems, however, to have been a period of suspense. Galileo received, as the result of a conference between Cardinals Bellarmine and Del Monte, a semi-official warning to avoid theology, and limit himself to physical reasoning. "Write freely," he was told by Monsignor Dini, "but keep outside the sacristy." Unfortunately, he had already committed himself to dangerous ground. In December he repaired personally to Rome, full of confidence that the weight of his arguments and the vivacity of his eloquence could not fail to convert the entire pontifical court to his views. He was cordially received, and eagerly listened to, but his imprudent ardor served but to injure his cause. On February 24, 1616, the consulting theologians of the Holy Office characterized the two propositions — that the sun is immovable in the center of the world, and that the earth has a diurnal motion of rotation — the first as "absurd in philosophy, and formally heretical, because expressly contrary to Holy Scripture," and the second as "open to the same censure in philosophy, and at least erroneous as to faith." Two days later Galileo was, by command of the pope (Paul V.), summoned to the palace of Cardinal Bellarmine, and there officially admonished not thenceforward to "hold, teach, or defend" the condemned doctrine. This injunction he promised to obey. On March 5th the Congregation of the Index issued a decree reiterating, with the omission of the word "heretical," the censure of the theologians, suspending, *usque corrigatur*, the great work of Copernicus *De Revolutionibus orbium celestium*, and absolutely prohibiting a treatise by a Carmelite monk named Foscarini, which treated the same subject from a theological point of view. At the same time it was given to be understood that the new theory of the solar system might be held *ex hypothesi*, and the trivial verbal alterations introduced into the Polish astronomer's book in 1620, when the work of revision was completed by Cardinal Gaetani, confirmed this interpretation. This edict, it is essential to observe, of which the responsibility rests with a disciplinary congregation in no sense representing the church, was never confirmed by the pope, and was virtually repealed in 1757 under Benedict XIV.

Galileo returned to Florence three months later, not ill-pleased, as his letters testify, with the result of his

visit to Rome. He brought with him, for the refutation of calumnious reports circulated by his enemies, a written certificate from Cardinal Bellarmine, to the effect that no abjuration had been required of or penance imposed upon him. During a prolonged audience he had received from the pope assurances of private esteem and personal protection; and he trusted to his dialectical ingenuity to find the means of presenting his scientific convictions under the transparent veil of an hypothesis. Although a sincere Catholic, he seems to have laid but little stress on the secret admonition of the Holy Office, which his sanguine temperament encouraged him gradually to dismiss from his mind. He preserved no written memorandum of its terms, and it was represented to him, according to his own deposition in 1633, solely by Cardinal Bellarmine's certificate, in which, for obvious reasons, it was glossed over rather than expressly recorded. For seven years, however, during which he led a life of studious retirement in the Villa Segni at Bellosguardo, near Florence, he maintained an almost unbroken silence. At the end of that time he appeared in public with his *Saggiatore*, a polemical treatise written in reply to the *Libra Astronomica* of Padre Grassi (under the pseudonym of Lotario Sarsi), the Jesuit astronomer of the Collegio Romano. The subject in debate was the nature of comets, the conspicuous appearance of three of which bodies in the year 1618 furnished the occasion of the controversy. Galileo's views, although erroneous, since he held comets to be mere atmospheric emanations reflecting sunlight after the evanescent fashion of a halo or a rainbow, were expressed with such triumphant vigor, and embellished with such telling sarcasms, that his opponent did not venture upon a reply. The *Saggiatore* was printed at Rome in October, 1623, by the Academy of the Lincei, of which Galileo was a member, with a dedication to the new pope, Urban VIII., and notwithstanding some passages containing a covert defense of Copernican opinions, was received with acclamation by the ecclesiastical, no less than by the scientific authorities. Everything seemed now to promise a close of unbroken prosperity to Galileo's career. Maffeo Barberini, his warmest friend and admirer in the Sacred College, was, by the election of August 8, 1623, seated on the pontifical throne; and the marked distinction with which he was received on his visit of congratulation to Rome in 1624 encouraged him to hope for the realization of his utmost wishes. He received every mark of private favor. The pope admitted him to six long audiences in the course of two months, wrote an enthusiastic letter to the grand-duke praising the great astronomer, not only for his distinguished learning, but also for his exemplary piety, and granted a pension to his son Vincenzo, which was afterward transferred to himself, and paid, with some irregularities, to the end of his life. But on the subject of the decree of 1616, the revocation of which Galileo had hoped to obtain through his personal influence, he found him inexorable. Nevertheless, the sanguine philosopher trusted, not without reason, that it would at least be interpreted in a liberal spirit, and his friends encouraged his imprudent confidence by eagerly retailing to him every papal utterance which it was possible to construe in a favorable sense. To Cardinal Hohenzollern Urban was reported to have said that the theory of the earth's motion had not been and could not be condemned as heretical, but only as rash; and in 1630 the learned Dominican monk Campanella wrote to Galileo that the pope had expressed to him in conversation his disapproval of the prohibitory decree. Thus, in the full anticipation of added renown, and without any misgiving as to the ulterior consequences, Galileo set himself, on his return to Florence,

to complete his famous but ill-starred work, the *Dialogo dei due Massimi Sistemi del Mondo*. Finished in 1630, it was not until January, 1632, that it emerged from the presses of Landini at Florence. The book was originally intended to appear in Rome, but unexpected obstacles interposed. The Lyncean Academy collapsed with the death of Prince Federigo Cesi, its founder and president; an outbreak of plague impeded communication between the various Italian cities; and the *imprimatur* was finally extorted, rather than accorded, under the pressure of private friendship and powerful interest. A tumult of applause from every part of Europe followed its publication; and it would be difficult to find in any language a book in which animation and elegance of style are so happily combined with strength and clearness of scientific exposition. Three interlocutors, named respectively Salviati, Sagredo and Simplicio, take part in the four dialogues of which the work is composed. The first named expounds the views of the author; the second is an eager and intelligent listener; the third represents a well-meaning but obtuse Peripatetic, whom the others treat at times with undisguised contempt. Salviati and Sagredo took their names from two of Galileo's early friends, the former a learned Florentine, the latter a distinguished Venetian gentleman; Simplicio ostensibly derived his from the Cilician commentator of Aristotle, but the choice was doubtless instigated by a sarcastic regard to the double meaning of the word. There were not wanting those who insinuated that Galileo intended to depict the pope himself in the guise of the simpleton of the party; this charge, however, was not only preposterous in itself, but wholly unsupported by intrinsic evidence, and Urban was far too sagacious to give any permanent credit to it.

It was at once evident that the whole tenor of this remarkable work was in flagrant contradiction with the edict passed sixteen years before its publication, as well as with the author's personal pledge of conformity to it. The ironical submission with which it opened, and the assumed indeterminateness with which it closed, were hardly intended to mask the vigorous assertion of Copernican principles which formed its substance. It is a singular circumstance, however, that the argument upon which Galileo mainly relied as furnishing a physical demonstration of the truth of the new theory rested on a misconception. The ebb and flow of the tides, he asserted, were a visible effect of the terrestrial double movement, since they resulted from the inequality of the absolute velocities through space of the various parts of the earth's surface, produced by the motion of rotation. To this notion, which took its rise in a confusion of thought, he attached capital importance, and he treated with scorn Kepler's suggestion that a certain occult attraction of the moon was in some way concerned in the phenomenon. The theological censures which the book did not fail to incur were not slow in making themselves felt. Toward the end of August the sale was prohibited; on October 1st, the author was cited to Rome by the Inquisition. He pleaded his age, now close upon seventy years, his infirm health, and the obstacles to travel caused by quarantine regulations; but the pope was sternly indignant at what he held to be his ingratitude and insubordination, and no excuse was admitted. At length, on February 13, 1633, he arrived at the residence of Niccolini, the Tuscan ambassador to the pontifical court, and there abode in deep dejection for two months. From April 12th to the 30th, he was detained in the palace of the Inquisition, where he occupied the apartments of the fiscal, and was treated with unexampled indulgence. On the 30th he was restored to the hospitality of Niccolini, his warm and generous partisan. The accusation against

him was that he had written in contravention of the decree of 1616, and in defiance of the command of the Holy Office communicated to him by Cardinal Bellarmine; and his defense consisted mainly in a disavowal of his opinions, and an appeal to his good intentions. On June 21st, he was finally examined under menace of torture; but he continued to maintain his assertion that, after its condemnation by the Congregation of the Index, he had never held the Copernican theory. Since the publication of the documents relating to this memorable trial, there can no longer be any doubt, not only that the threat of torture was not carried into execution, but that it was never intended that it should be. On June 22d, in the church of Santa Maria sopra Minerva, Galileo read his recantation, and received his sentence. He was condemned, as "vehemently suspected of heresy," to incarceration at the pleasure of the tribunal, and by way of penance was enjoined to recite once a week for three years the seven penitential psalms. This sentence was signed by seven cardinals, but did not receive the customary papal ratification. The legend according to which Galileo, rising from his knees after repeating the formula of abjuration, stamped on the ground, and exclaimed, "*E pur si muove!*" is, as may readily be supposed, entirely apocryphal. The earliest ascertained authority for it is the seventh edition of an *Historical Dictionary*, published at Caen in 1789. It seems probable that Galileo remained in the custody of the Inquisition from June 21st to the 24th, on which day, he was relegated to the Villa Medici on the Trinità de' Monti. Thence, on July 6th, he was permitted to depart for Siena, where he spent several months in the house of the archbishop, Ascanio Piccolomini, one of his numerous and trusty friends. It was not until December that his earnest desire of returning to Florence was realized, and there, in the Villa Martellini at Arcetri, he spent the remaining eight years of his life in the strict retirement which was the prescribed condition of his comparative freedom.

Domestic afflictions combined with numerous and painful infirmities to embitter his old age. His sister-in-law and her whole family, who came to live with him on his return from Rome, perished shortly afterward of the plague; and on April 1, 1634, died, to the inexpressible grief of her father, his eldest and best-beloved daughter, a nun in the convent of San Matteo, at Arcetri. Galileo was never married; but by a Venetian woman, named Marino Gamba, he had three children—a son who married and left descendants, and two daughters who took the veil at an early age. Notwithstanding this stain on the morality of his early life, which was in some degree compensated by the regularity of his subsequent conduct, Galileo's general character was one which commanded the respect of all who approached him. His prodigious mental activity continued undiminished to the last, nor were his latter years the least profitable to science of his long and eventful career. In 1636 he completed his *Dialoghi delle Nuove Scienze*, in which he recapitulated the results of his early experiments and mature meditations on the principles of mechanics. This, in many respects his most valuable work, was printed by the Elzevirs at Leyden in 1638, and excited admiration equally universal and more lasting than that accorded to his astronomical treatises. His last telescopic discovery—that of the moon's diurnal and monthly librations—was made in 1637, only a few months before his eyes were forever closed in hopeless blindness. It was in this condition that Milton found him when he visited him at Arcetri in 1638. But the fire of his genius was not even yet extinct. He continued his scientific correspondence with unbroken interest and undiminished logical acumen; he

thought out the application of the pendulum to the regulation of clock-work, which Huygens successfully realized seventeen years later; and he was engaged in dictating to his disciples, Viviani and Torricelli, his latest ideas on the theory of impact when he was seized with the slow fever which in two months brought him to the grave. On January 8, 1642, he closed his long life of triumph and humiliation, and the coincidence of the day of his birth with that of Michelangelo's death was paralleled by the coincidence of the year of his death with that of the birth of Isaac Newton.

GALION, the capital of Crawford county, Ohio, is a thriving town of (1900) 7,282 inhabitants. It is situated in the midst of a rich section, and is of considerable commercial importance. It has railroad, banking and telegraph facilities, and is steadily growing.

GALITCH, or HALICZ, a town of Russia, at the head of a district in the government of Kostroma, eighty miles northeast of Kostroma, on the low southeastern shore of Galitch Lake.

GALL, FRANZ JOSEPH, anatomist, physiologist, and founder of phrenology, was born at Tiefenbrunn, near Pforzheim, Baden, March 9, 1758. After completing the usual literary course at Baden and Bruchsal, he began the study of medicine under Hermann at Strasburg, whence, attracted by the names of Van Swieten and Stoll, he removed to Vienna in 1781. Having received his diploma, he began to practice as a physician there in 1785; but his energies were mainly devoted to the scientific investigation of problems which, even from boyhood, had been occupying his attention. At a comparatively early period he had formed a generalization which he believed to be a sound one, that in the human subject at least a powerful memory is invariably associated with prominent eyes; and further observation had enabled him, as he thought, also to define the external characteristics indicative of special talents for painting, music, and the mechanical arts. Following out these researches, he gradually reached the strong personal conviction, not only that the talents and dispositions of men are dependent upon the functions of the brain, but also that they may be inferred with perfect exactitude and precision from the external appearances of the skull. Gall's first appearance as an author was made in 1791, when he published the first two chapters of a (never completed) work entitled *Philosophisch-medizinische Untersuchungen über Natur u. Kunst im kranken u. gesunden Zustande des Menschen*. The first public notice of his inquiries in craniology, however, was in the form of a familiar letter addressed to a friend, which appeared in Wieland's *Deutscher Mercur* in 1798; but two years before this Gall had commenced giving private courses of phrenological lectures in Vienna, where his doctrines soon attracted general attention, and met with increasing success until, in 1802, they were interdicted by the government on the ground that they were dangerous to religion. This step on the part of the authorities had the effect of greatly stimulating public curiosity, and increasing Gall's celebrity. In March, 1805, he finally left Vienna, in company with his friend and associate, Spurzheim, and made a tour through Germany, in the course of which he lectured in Berlin, Dresden, Magdeburg, and several of the university towns. These expositions, which he knew how to make popular and attractive, were much resorted to by the public, and excited considerable controversy in the scientific world. He had almost reached the zenith of his fame when, in 1807, he repaired to Paris and established himself there as a medical practitioner, at the same time continuing his activity as a lecturer and writer. In 1808 appeared his *Introduction au cours de physiologie du cerveau*, which was followed in 1809 by the *Recherches sur le*

système nerveux en général et sur celui du cerveau en particulier (originally laid before the Institute of France in March, 1808), and in 1810 by the first installment of the *Anatomie et Physiologie du système nerveux en général, et du cerveau en particulier, avec des observations sur la possibilité de reconnaître plusieurs dispositions intellectuelles et morales de l'homme et des animaux par la configuration de leurs têtes. The Recherches* and the first two volumes of the *Anatomie*, bear the conjoint names of Gall and Spurzheim. The latter work was completed in 1819, and appeared in a second edition of six 8vo volumes shortly afterward (1822-25). In 1811 he replied to a charge of Spinozism or atheism, which had been strongly urged against him in certain quarters, by a treatise entitled *Des dispositions innées de l'âme et de l'esprit*, which he afterward incorporated with his greater work. In 1819 he became a naturalized French subject, but his efforts two years afterward to obtain admission to the Academy of Sciences, although supported by Geoffroy St. Hilaire, were unsuccessful. In 1823 he visited London with the intention of giving a series of phrenological lectures, but was disappointed of the reception he had anticipated, and speedily abandoned his plans. He continued to lecture and practice in Paris until the beginning of 1828, when he was disabled by an apoplectic seizure. His death took place at Montrouge, near Paris, on August 22, 1828. The *Anatomie* has been translated into English by Lewis (Boston, Mass., 1835).

GALLAND, ANTOINE, Orientalist and archæologist, the first European translator of the *Arabian Nights*, was born in 1646, at Rolloit, in the department of Somme. He died February 17, 1715.

GALLARATE, a flourishing town of Italy, the head of a circle in the province of Milan, situated on the railway twenty-three miles northwest of Milan at the junction of the line running north to Varese.

GALLAS, or more correctly GALLA, a powerful race of eastern Africa, scattered over the wide region which extends for about 1,000 miles from the interior of Abyssinia to the neighborhood of the river Sabacki, in 3° 12' of S. latitude. Almost nothing has been definitely ascertained about the early homes and migrations of the race; but it appears to have occupied the southern portion of its present territory for nearly four centuries at least.

GALLATIN, ALBERT, American statesman, was born in Geneva, Switzerland, January 29, 1761. He was left an orphan at the age of nine years, and his early training devolved upon his grandparents, and an intimate friend, Mlle. Pictet. He received a thorough education and was graduated in 1779, standing well in his classes. In 1780 he emigrated to the United States in company with a friend, and they at once proceeded to New England, where they engaged in business. Having failed in this venture, Gallatin entered Harvard College as a French teacher, in which occupation he met with some success; but becoming disgusted with the manners and customs of the New Englanders, he again changed his place of residence and his business, going to Pennsylvania and Virginia, where he engaged in land speculation.

In 1793 he was elected U. S. senator from Pennsylvania by a mixed vote, but his election was annulled by the Senate on account of defective citizenship. He at once returned to Pennsylvania, where he took part in the whisky rebellion, at first exciting the distillers to resist the imposition of the tax, but exerting himself to the utmost to prevent bloodshed when he saw such a contingency among the probabilities. It was due to him alone that bloodshed was prevented at Old Redstone Fort in August, 1794, on which occasion the govern-

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GALLE, or POINT DE GALLE, a town and port in the southern portion of Ceylon, on the southwestern coast, about seventy-two miles south of Colombo, with which it is connected by a good carriage road. It was made a municipality in 1865, and divided into the five districts of the Fort, Callowelle, Galopiadde, Hirimbure, and Cumbalwalla. Population, (1901), 37,326.

GALLIC ACID, trioxybenzoic acid, or dioxysalicylic acid, the *acidum gallicum* of pharmacy, is a substance discovered by Scheele, which exists as such in the leaves of the bearberry, in pomegranate root-bark, and in tea, in gall-nuts to the extent of about three per cent., and in other vegetable productions.

Gallic acid has been advantageously employed as an internal medicinal agent in scarlatinal albuminuria, in which its effect appears to be due to an astringent and tonic action on the inflamed capillaries of the kidneys; in other forms of albuminuria; in cases of chyluria, in which, as not causing nausea and headache, it is preferable to tannic acid, and in pyrosis, diarrhoea, some forms of dysentery, and tabes and rickets, and atonic states of the alimentary canal and of the body generally. In checking the night-sweats of phthisis it has been found of especial service. As a hæmostatic, when administered internally, it has proved of value in hæmate-

mesis, epistaxis, fungus hæmatodes, menorrhagia, and more particularly in hæmaturia.

GALLIENUS, P. LICINIUS, a Roman emperor, son of the emperor Valerian, was born about 218. From 253 to 260 he reigned conjointly with his father, and gave proof of both bravery and ability, especially in the defeat near Milan of 300,000 Alemanni, with a force of only 10,000 Romans. Gallienus was killed at Milan in 268 while besieging Aureolus, who had been proclaimed emperor by the Illyrian legions.

GALLINACEOUS BIRDS (Lat. *gallus*, a cock), or RASORES (Lat. scrapers), an order of birds, more generally valuable to man than any other order, containing at once the most important species domesticated as poultry, and those most sought after as game. The common domestic fowl may be regarded as the type of the order. Like it, the gallinaceous birds in general have a small head; a rather short bill, with the upper mandible arched; nostrils placed on the sides of the bill, and usually in a soft membranous space at its base; the figure bulky; the wings short, and not governed by powerful muscles, nor adapted for long or rapid flight; the feet with three toes before, and one behind—which is articulated higher than the others, and is sometimes wanting—adapted for walking on the ground, and for scraping, in order to procure food; the digestive organs complex, the crop large, the gizzard muscular, the intestine long, with two very large *cæca*. The order includes guans, pheasants, grouse, partridges, quails, ptarmigans, peacocks, turkeys, guinea-fowls, tragopans, and tinamous.

GALLINULE. See MOORHEN.

GALLIO, JUNIUS ANNÆUS, proconsul or "deputy" of Achaia at the time of the apostle Paul's first visit to Corinth (53 A.D.), was the son of M. Andæus Seneca, a Roman eques and rhetorician, and was born at Cordova about the beginning of the Christian era. He was appointed proconsul under Claudius. In the fifth year of Nero we hear of him as having been again in Rome.

GALLIPOLI, a seaport town of Turkey in Europe, in the province of Rumili and vilayet of Edirneh, at the northeast extremity of the Straits of Dardanelles, on a narrow peninsula 130 miles southwest of Constantinople, and ninety miles due south of Adrianople. Population, 30,000.

GALLIPOLI, an important seaport town of Italy, in the province of Lecce, and about twenty-five miles northeast of the city of that name, beautifully situated on a rocky islet on the east shore of the Gulf of Taranto, and connected by a long stone bridge of twelve arches with the suburb of Lizza on the mainland.

GALLIPOLIS, the county seat of Gallia county, Ohio, is a thriving town with railroads, banks, and telegraphs. It has considerable traffic and a population steadily increasing—now (1900) numbering 5,432.

GALLIUM, so called in honor of France (Gallia), symbol Ga, atomic weight 69.9, a metal discovered August 27, 1875, by M. Lecoq de Boisbaudran, in the spectroscopic examination of zinc-blende from Pierrefitte in the valley of Argeles, Hautes Pyrénées, and since found to exist in blende from several other localities, notably in that of the mines of Lüdrich and Apfel at Bensberg, on the Rhine, which contains nearly sixteen milligrams per kilogram. Its density and approximate atomic weight, and other of its characters, were predicted by Mendeleff.

GALLOWAY, THOMAS, a Scottish mathematician, was born at Symington, in the upper ward of Lanarkshire, February 27, 1796. After receiving such education as the schools of his own and adjoining parishes could give, he entered in 1812 the University of Edin-

burgh, where he distinguished himself specially in mathematics. In 1823 he was appointed one of the teachers of mathematics at the military college of Sandhurst, and on the death of Sir John Leslie, in 1832, he was an unsuccessful candidate for the vacant chair of natural philosophy in Edinburgh. In the following year he was appointed actuary to the Amicable Life Assurance Office, the oldest institution of that kind in London, and in this situation he remained till his death, November 1, 1851. Galloway was a voluminous though, for the most part, an anonymous writer, and took a leading part in the proceedings of the principal scientific societies of London.

GALLS. In animals galls occur mostly on or under the skin of living mammals and birds, and are produced by Acaridea, and by dipterous insects of the genus *Estrus*. Signor Moriggia has described and figured a horny excrescence, nearly eight inches in length, from the back of the human hand, which was caused by *Acarus domesticus*. What are commonly known as galls, are vegetable deformities or excrescences, due to parenchymatous hypertrophy, and, according to the definition of Lacaze-Duthiers, comprise "all abnormal vegetable productions developed on plants by the action of animals, more particularly by insects, whatever may be their form, bulk, or situation." For the larvæ of their makers the galls provide shelter and sustenance.

Galls are formed by insects of several orders. Among the Hymenoptera are the gall-wasps (*Cynips* and its allies), which infest the various species of oak. They are small insects, having straight antennæ, and a compressed, usually very short abdomen, with the second, or second and third segments greatly developed, and the rest imbricated, and concealing the partially coiled ovipositor. The transpositions from the larval state are completed within the gall, out of which the imago, or perfect insect, tunnels its way, usually in autumn, though sometimes, as has been observed of some individuals of *Cynips Kollar*i, after hibernation.

GALLUPPI, PASQUALE, a distinguished Italian philosopher, was born on April 2, 1770, at Tropea, in Calabria. He was of good family, and after completing his education at the academy of Tropea and the university of Naples he entered the public service, and was for many years employed in the office of the administration of finances. Altogether apart from academic influences he pursued his favorite studies, and it was not till he had reached the age of sixty, and had become widely known by his writings on philosophy, that he was called to a chair in the university of Naples. This chair he held till his death in November, 1846.

GALLUS, C. CORNELIUS, a Roman poet, orator, and politician, was born of humble parents at Forum Julii (Fréjus), in Gaul, about the year 66 B.C. Gallus enjoyed a high reputation among his contemporaries as a man of intellect. He associated on terms of equality with Virgil, Ovid, Varius, Asinius, Pollio, and others, and on account of his four books of elegies Ovid claimed for him the first place among the elegiac poets of Rome. His fame as an orator was hardly inferior to his renown as a poet; but as not a fragment of his composition has descended to our times, we have no means of judging the worth of his literary pretensions, and have to content ourselves with the somewhat partial estimate of his personal friends. He died by suicide 26 B.C.

GALT, a Canadian town in Waterloo county, Province of Ontario, having some commercial importance, railroad, banking and telegraph facilities, etc.; population (1901) of 7,866.

GALT, JOHN (1779-1889), a Scottish novelist, was born at Irvine, in Ayrshire.

Galt, like almost all voluminous writers, was exceed-

highly unequal. His masterpieces are *The Ayrshire Legatees*, *The Annals of the Parish*, *Sir Andrew Wyllie*, *The Entail*, *The Provost*, and *Lavvie Todd*. *The Ayrshire Legatees* gives, in the form of a number of exceedingly diverting letters, the adventures of the Rev. Dr. Pringle and his family in London. The letters are made the excuse of endless tea-parties and meetings of kirk session in the rural parish of Garnock. *The Annals of the Parish* are told by the Rev. Micah Bahlwhidder, Galt's finest character. He died April 11, 1839.

GALOIS, EVARISTE, an eminently original and profound French mathematician, born October 26, 1811; killed in a duel May, 1832.

GALUPPI, BALDASSARRE, a musical composer, was born in 1706, in the island of Burano, near Venice. He died in 1785, and left 50,000 lire to the poor of Venice.

GALVANI, LUIGI, an eminent Italian physiologist, after whom galvanism received its name, was born at Bologna, September 9, 1737. It was his wish in early life to enter the church, but by his parents he was educated for a medical career. At the university of Bologna, in which city he practiced, he was in 1762 appointed public lecturer in anatomy, and soon gained repute as a skilled, though not eloquent teacher, and, chiefly from his researches on the organs of hearing and genito-urinary tract of birds, as a comparative anatomist. His celebrated theory of animal electricity he enunciated in a treatise, *De viribus electricitatis in motu musculari commentarius*, published in the eighth volume of the memoirs of the Institute of Sciences at Bologna in 1791, and separately at Modena in the following year, and elsewhere subsequently. The statement has frequently been repeated that, in 1786, Galvani had skinned some frogs to make broth for his wife, who was in delicate health; that the leg of one of these, on being accidentally touched by a scalpel which had laid near an electrical machine, was thrown into violent convulsions; and that it was thus that his attention was first directed to the relations of animal functions to electricity. From documents in the possession of the Institute of Bologna, however, it appears that twenty years previous to the publication of his *Commentary* Galvani was already engaged in investigations as to the action of electricity upon the muscles of frogs. The observation that the suspension of certain of these animals on an iron railing by copper hooks caused twitching in the muscles of their legs led him to the invention of his metallic arc, the first experiment with which is described in the third part of the *Commentary*, wherein it is registered September 20, 1786. The arc he constructed of two different metals, which, placed in contact the one with a nerve and the other with a muscle of a frog, caused contraction of the latter. On Galvani's refusal to take the oath of allegiance to the Cisalpine republic on its establishment, he was removed from his professorship. Deprived thus of the means of livelihood, he retired to the house of his brother Giacomo, where he soon fell into a feverish decline. The republican government, in consideration of his great scientific fame, eventually, but too late, determined to reinstate him in his chair at the university of Bologna. He died December 4, 1798.

GALVANISM. See ELECTRICITY and PHYSIOLOGY.

GALVANOMETER, an instrument used for indicating or measuring currents of electricity, wherein advantage is taken of the force exerted by such currents on movable magnets in their neighborhood. When a galvanometer is used for indicating merely, without measuring, it is sometimes called a galvanoscope. If we consider only such instruments as have come into actual

use, this definition is strict enough for practical purposes. If we were to consider all the instruments that have been or might be made, some would come under the definition whose resemblance to the modern galvanometer would not at first sight be apparent. Such, for instance, is the electro-magnetic balance of Becquerel, which consists of two bar magnets hung from the scale pans of a delicate balance, each in the axis of a cylindrical bobbin of wire—one being over, the other under its corresponding bobbin. The north poles of both magnets hang downwards, and the current to be measured is sent around the bobbin, so that each of the magnets is repelled. Weights are put into the left-hand scale until equilibrium in the original position is restored. The weight thus added is proportional to the current strength, so long as the induced magnetism of the magnets can be neglected. This instrument has fallen into disuse.

*GALVESTON is the name of a county, city, bay and island, forming part of the State of Texas, U. S. A. The county borders upon the Gulf of Mexico. The bay is an irregular sheet of water, its greatest length being nearly forty miles, receiving the waters of the Trinity and other rivers and opening into the Gulf. The island is a strip of sandy beach, from one to two miles wide and nearly thirty miles long, fronting upon the Gulf and separated from the mainland of Texas by the sound known as West Bay. The city of Galveston is situated on Galveston Island, at its northeastern end, which forms one side of the passageway from Galveston Bay to the Gulf. It lies in latitude 29° 18' north and longitude 94° 47' west. Although in a sub-tropical climate it is an eminently healthful place, with a temperature ranging from 30° to 97° Fahrenheit, and averaging 70°, and a rainfall of 60 inches a year. The place first became known in 1816-17, when the outlaw John Aury made it the headquarters of his gang. Although it was then Spanish territory, the United States sent a military expedition thither and drove the outlaws away. The island then remained unoccupied until 1837, when Texas had declared her independence of Mexico and was seeking annexation to the United States. In that year the city of Galveston was founded. Its growth has been steady, and commensurate with the development of Texas, of which State it is the chief port and largest city. It is indeed the second port, after New Orleans, on the whole Gulf coast of the United States. Although on an island it has direct railroad connections with the chief systems of Texas and the United States, and is connected by direct steamship lines with Havana, New York, Liverpool, Bremen and other ports. It is the seat of Galveston County, and contains the county court house, a United States Court House, St. Mary's University, the Texas Medical College, a Roman Catholic Cathedral, a convent, and many schools, hospitals, asylums, etc. It has extensive iron, cotton and other industrial establishments. The harbor is protected by a breakwater, and the city is shielded from the Gulf by a massive sea wall. Exports of merchandise in 1903 were \$104,121,087, and imports, \$1,511,119. Clearing-house exchanges in 1903 were \$205,350,500. The population was 4,177 in 1850; 7,307 in 1860; 13,818 in 1870; 22,248 in 1880; 28,084 in 1890; and 37,700 in 1900. In the last named year Galveston was the 102nd city in the United States in population.

W. FLETCHER JOHNSON.

N. B. An account of the great flood of Sept. 1903 is given in the Supplement, p. 1361.

GALWAY, a maritime county in the province of Connaught, in the extreme west of Ireland, is bounded on the north by Mayo and Roscommon; east by Roscommon, King's county, and Tipperary; south by Clare and the Bay of Galway; and west by the Atlantic Ocean. The area comprises 2,372 square miles, or 1,566,080 acres, of which 90,230 are under water. The county is naturally divided by Lough Corrib into two great divisions. The eastern, which comprehends all the county except the four western baronies, rests on a limestone base, and is, generally speaking, a level

champaign country, but contains large quantities of wet bog. Its southern portion is partly a continuation of the Golden Vale of Limerick, so celebrated for its fertility, and partly occupied by the Slivebaught Mountains. The northern portion of the division contains rich pasture and tillage ground, beautifully diversified with hill and dale. Some of the intermediate country is comparatively uncultivated, but forms excellent pasturage for sheep. The western division of the country has a substratum of granite and is barren, rugged and mountainous.

Galway enjoys the advantage of a very extended line of sea-coast, indented by numerous harbors, which, however are rarely used excepting by a few coasting and fishing vessels. Commencing at the coast of Mayo in the north are the Killeries, two bays which separate the counties of Galway and Mayo. The first bay on the western coast capable of accomodating large ships is Ballynakill, sheltered by Freaghillaun or Heath Island. Next in succession is Cleggan Bay, having Innishboffin in its offing. Streamstown is a narrow inlet, within which are the inhabited islands of Omev, Turbot and Inishturk. Ardhear harbor divides itself into two inlets; the northern terminated by the town of Clifden, with excellent anchorage opposite the castle; the southern inlet has also good anchorage within the bar, and has a good salmon fishery.

The rivers are few and, except the Shannon, are of small extent. The Suck, which forms the eastern boundary of the county, rises in Roscommon, and, passing by Ballinasloe, unites with the Shannon at Shannon bridge. The Shannon, which rises at the foot of Cuileagh in the county of Cavan, forms the southeastern boundary of the county, and, passing Shannon Harbor, Banagher, Meelick, and Portumna, swells into the great expanse of water called Lough Derg, which skirts the county as far as the village of Mount Shannon. The Claregalway flows southward through the center of the county, and enters Lough Corrib some four miles above the town of Galway. The Ballynahinch, considered one of the best salmon-fishing rivers in Connaught, rises in the Twelve Pins, passes through Ballynahinch Lake, and, after a short but rapid course, falls into Birturbuy Bay.

The lakes are numerous. Lough Corrib extends from Galway town northward over 30,000 acres, with a coast of fifty miles in extent. It has now been made navigable to Lough Mask (which lies chiefly in Mayo county) and to the sea at Galway. The lake is studded with many islands, some of them thickly inhabited. Near it is Lough Ross, which receives a large supply of water from streams, but has no visible outlet. The district to the west of Lough Corrib contains in all about 130 lakes, twenty-five of them each more than a mile in length. Lough Rea, at the town of the same name, is more remarkable for scenic beauty than for extent. The climate is mild and salubrious but variable, and violent winds from the west are not uncommon. Frost and snow seldom remain long on the western coast, and cattle of every description continue unhouseed during the winter. The eastern part of the county produces the best wheat. Oats are frequently sown after potatoes in moorish soils less adapted for wheat. The flat shores of the bays afford large supplies of seaweed for manure. Limestone, gravel and marl are to be had in most other parts. When a sufficient quantity of manure for potatoes can not be had, the usual practice is to pare and burn the surface.

In many places on the sea shore, fine early potatoes are raised in deep sea sand, manured with sea-weed, and the crop is succeeded by barley. Those parts of the eastern districts less fitted for grain are employed in pasture. Sheep-walks occupy a very large tract between Monivea and Galway.

Manufactures are not carried on beyond the demand caused by the domestic consumption of the people. Coarse friezes, flannels and blankets are made and sold largely in Galway and Loughrea. Connemara has been long celebrated for its hand-knit woolen stockings. Coarse linen of a narrow breadth, called bandle linen, is also made for home consumption. A linen-weaving factory has been established at Oughterard. The manufacture of kelp, formerly a great source of profit to the western shores, is still carried on to some extent. Feathers and sea-fowls' eggs are brought in great quantities from the island of Aran, the produce of the puffins and other sea fowl that frequent the cliffs. Fishing affords occupation to many of the inhabitants, but from want of capital is not prosecuted with sufficient vigor. The number of vessels engaged is 451, with 1,104 men and 58 boys.

The county includes one parliamentary borough, Galway; and three townships, Ballinasloe (part of which is however in the county of Roscommon), 4,159; Loughrea, 3,072; and Tuam, 4,223. The largest of the villages are Gort, 1,773; Clifden, 1,313; Athenry, 1,194; Headford, 870; Oughterard, 861; and Eyrecourt, 747. The population in 1831 was 414,684; in 1851, 321,684; and in 1901, 192,146.

GALWAY, the county town, and a parliamentary borough, is also a county in itself, with an exclusive jurisdiction extending two miles on every side except the south. It stands on the northern shore of the Bay of Galway, on both sides of the river Corrib, which connects Lough Corrib with the sea.

GAMA, VASCO DA, the celebrated Portuguese navigator and discoverer, was born at Sines, a small sea-town in the province of Alentejo. Of Vasco's early history little is known. He was born most likely in 1460. His first service of distinction was in 1497, when he was sent out by King Manoel, of Portugal, to explore the eastern portion of Africa and to find the mythical domains of "Prester John." The fleet, consisting of four vessels specially built for this mission, sailed down the Tagus on July 8, 1497, after prayers and confession made by the officers and crews in the presence of the king and court, in a small chapel on the site where now stands the church of S. Maria de Belem, afterward built to commemorate the event. Four months later it cast anchor in St. Helena Bay, South Africa, rounded the Cape in safety, and in the beginning of the next year reached Melinda. Thence, steering eastward, under the direction of a pilot obtained from Indian merchants met with at this port, Gama arrived at Calicut, on the Malabar coast, on May 20, 1498, and set up, according to the custom of his country, a marble pillar as a mark of conquest and a proof of his discovery of India. His reception by the zamorin, or ruler of Calicut, would have in all probability been favorable enough, had it not been for the jealousy of the Moorish traders who, fearing for their gains, so incited the Hindus against the new comers that Gama, after escaping from enforced detention on shore, was obliged to fight his way out of the harbor. Having seen enough to assure him of the great resources of this new country, he returned home in September, 1499, with a glowing description of it. The king received him with every mark of distinction, created him a noble, and ordered

magnificent fêtes to be held in his honor in the principal towns of the kingdom, "for he had brought back (not without severe loss in ships and in men) the solution of a great problem, which was destined to raise his country to the acme of prosperity." In prosecution of Gama's discoveries another fleet of thirteen ships was immediately sent out to India by Manoel, under Alvarez Cabral, who, in sailing too far westward, by accident discovered Brazil, and on reaching his destination established a factory at Calicut. The natives, again instigated by the Moorish merchants, rose up in arms, and murdered all whom Cabral had left behind. To avenge this outrage a powerful armament of ten ships was fitted out at Lisbon, the command of which was at first given, to Cabral, but was afterward transferred to Gama on his urgent petition; for, "Sire," he said, "the king of Calicut arrested me and treated me with contumely, and because I did not return to avenge myself of that injury he has again committed a greater one, on which account I feel in my heart a great desire and inclination to go and make great havoc of him." In the beginning of 1502 the fleet sailed, and on reaching Calicut Gama immediately bombarded the town, enacting deeds of inhumanity and savagery too horrible to detail, and equaled only by the tortures of the Inquisition. Gama was naturally "very disdainful, ready to anger, and very rash;" but no peculiarities of disposition—nothing whatever—can excuse such acts as his, which have justly left a stain on his character that neither time nor brightness of his fame as a navigator can in the slightest degree obliterate. From Calicut he proceeded in November to Cochin, "doing all the harm he could on the way to all that he found at sea," and, having made favorable trading terms with it and other towns on the coast, he returned to Lisbon in September, 1503, with richly laden ships. He and his captains were welcomed with great rejoicings; "but to Dom Vasco the king gave great favors, and all his goods free and exempt; he granted him the anchorage dues of India, made him admiral of its seas forever, and one of the principal men of his kingdom." Soon after his return Vasco retired to his residence in Evora, and for twenty years took no part in public affairs, either from pique at not obtaining, as is supposed by some, so high rewards as he expected, or because he had in some way offended Manoel. During this time the Portuguese conquests increased in the East, and were presided over by successive viceroys. The fifth of these was so unfortunate that Gama was recalled from his seclusion by Manoel's successor, João III., created count of Vidigueira, and nominated viceroy of India, an honor which in April, 1524, he left Lisbon to fill. Arriving at Goa in September of the same year, he immediately set himself to correct, with vigor and firmness, the many abuses and evil practices which had crept in under the rule of his predecessors. He was not destined, however, to prosecute far the reforms he had inaugurated, for on Christmas eve following his arrival he died, while at Cochin, after a short illness, and was buried in the Franciscan monastery there. In 1538 his body was conveyed to Portugal and entombed in the town of Vidigueira, of which he was count, with all the pomp and honor due to one who had been the king's representative.

The important discoveries of Vasco da Gama had the immediate result of enriching Portugal, and raising her to one of the foremost places among the nations of Europe, and by degrees the far greater one of hastening colonization and civilization of the East by opening its commerce to the great Western powers.

GAMALIEL, God is a rewarder, a Hebrew proper name, which occurs more than once in the Old Testa-

ment, is repeatedly met with in the history of later Judaism. Of the persons designated by it the most important are enumerated below:

1. **GAMALIEL**, or Rabbah Gamliel the elder, as he is invariably called in the Talmud to distinguish him from his grandson, Rabbah Gamaliel or Gamliel of Jabneh (Jamnia), was the son of Rabbi Simeon, and the grandson of Rabbi Hillel. Of his biography little is known beyond the facts that, early in the first century, he lived and taught in Jerusalem, where Saul of Tarsus was for some time his pupil; and that he was a member of the Sanhedrim, which body he successfully counseled to moderation in their treatment of the followers of Jesus. He appears to have died before the destruction of the city. The Talmudists speak of him as having enjoyed the confidence of Cypros, the wife of Agrippa, and having been president of the Sanhedrim during the reigns of Tiberius, Caligula, and Claudius; but the latter representation at least is certainly unhistorical, as may be learned from the New Testament and from Josephus, where it is invariably the high priest who presides over the council.

2. **GAMALIEL** of Jabneh ranks with his grandfather, Gamaliel the elder, as one of the seven great rabbans of the Talmudists. His father also was named Simeon. On the death of Rabbi Johanan ben Zacai, Gamliel was chosen to succeed him as head of the famous school which had transferred itself to Jamnia or Jabneh shortly before the destruction of Jerusalem. He died about 115 A.D.

3. A third **GAMALIEL**, son of Jehudah-ha-Nasi, is mentioned in *Aboth*, as having specially insisted on the necessity of combining with the study of the law some active employment in order to the maintenance of a healthy moral tone.

GAMBIA, **GAMERA**, **BA DIMMA**, or **FURA**, an important river of Western Africa, which enters the Atlantic about 13° 50' N. latitude. Its sources are in the central plateau of the Futa Jallon highlands, a tract of country about 240 miles inland, which also contains the head waters of the Senegal, the Faleme, the Rio Grande, and some tributaries of the Niger. Flowing almost due north for the first 200 miles of its course, it turns somewhat abruptly to the west and continues in that direction through a country of great fertility. Steamers can proceed up the river as far as Yaba Tenda; the channel remains navigable for boats 300 miles from the mouth to the falls of Barraconda; and above the falls it is again navigable, as was shown by Governor Macdonnell's expedition in 1851, for at least 160 miles farther. The principal affluent is the Neries, which, coming from the north, joins the main stream about thirty or thirty-five miles above the falls. At Fattatenda, a short distance below the falls, the river has a breadth, even in the dry season, of about 320 feet, with a depth of from thirteen to twenty feet. In the rainy season it rises from twenty to fifty feet, and the whole country downward to the sea is laid under water, and receives a rich alluvial deposit.

GAMBIER, **GAMBIER**, or **PALE CATECHU**. See **CATECHU**.

GAMBIER, **JAMES**, **BARON**, English admiral, was born on October 13, 1756, at the Bahamas, of which his father, John Gambier, was at that time lieutenant-governor. He entered the navy in 1767 as a midshipman. In 1795 he was advanced to the rank of rear-admiral, and appointed one of the lords of the Admiralty. In November, 1805, he was raised to the rank of admiral; and in the summer of 1807, while still a lord of the Admiralty, he was appointed to the command of the fleet ordered to the Baltic, which, in concert with the army under Lord Cathcart, reduced

Copenhagen, and enforced the surrender of the Danish navy, consisting of nineteen ships of the line, besides frigates, sloops, gunboats, and naval stores.

In the spring of the following year he gave up his seat at the Admiralty on being appointed to the command of the Channel Fleet; and in that capacity he witnessed the partial, and prevented the total, destruction of the French fleet in Basque Roads, on April 12, 1809. In 1830 he was raised to the high rank of admiral of the fleet, and he died April 19, 1833.

GAMBOGE, the drug *Cambogia*, a gum-resin procured from *Garcinia Morella*, a member of the natural order *Guttiferae*, and indigenous to Camboja (see CAMBODIA), and parts of Siam and of the south of Cochinchina, formerly comprised in Cambodian territory. The juice, which when hardened constitutes gamboge, is contained in the bark of the tree, chiefly in numerous ducts in its middle layer, and from this it is procured by making incisions, bamboo joints being placed to receive it as it exudes.

GAME. Certain species of birds and animals, which inhabit various portions of the world, are, by common custom, designated as game. This designation does not include all *feræ natura*, but only those which are good for food, or else, by their presence, are dangerous to man or to domestic animals, and their pursuit and capture are indulged in by some persons as a vocation, or as a means of obtaining food, and by others for purposes of recreation. Most States and Territories have laws which prohibit the killing of game, except during a brief period in summer or autumn. Several States prohibit the exportation of game; one (Missouri) has a law which makes it a misdemeanor for any non-resident to hunt within her boundaries, and one (New Jersey) requires non-residents to pay a license fee in order to shoot within her limits. Among large mammals, designated as game, may be mentioned the buffalo (now nearly extinct in its wild state), the moose, elk, caribou, deer, antelope, Rocky mountain sheep and goat, the bear, cougar, and wolf. The moose is found in northern Maine, northwestern Minnesota, and in portions of Montana, Idaho, Washington, and British America. The elk is found in northeastern Minnesota, Montana, Idaho, Washington, Oregon, Colorado, New Mexico, Arizona, and the Canadian Northwestern Provinces. The range of the caribou extends through northern Maine, eastern Canada, northeastern Minnesota, British Columbia, and northern Washington; while some one of the various species of deer may be found in nearly every State or Territory of the Union, and throughout British America. The black bear is also widely distributed throughout the Union, while the habitat of the grizzly is confined to the regions west of the Missouri river, and that of the polar bear to the Arctic regions. The antelope is found on the great plains of the far West, and the Rocky mountain sheep and goat are, as their names indicate, natives of the mountainous regions west of the Missouri river. The cougar, wolf and several other mammals of the non-edible class are widely distributed and are hunted for sport or for peltry. Of American water-fowls the best known are the several species of wild geese, brants and ducks. These are all migratory, breeding in the far North and Northwest, and going south to spend the winters. In their semi-annual migrations they stop to rest and feed at various lakes, or on the uplands, of which habit sportsmen and market hunters take advantage. Canvasback and red-head ducks are perhaps prized more highly than any others, and their favorite resorts, en route, are certain lakes in Wisconsin and Illinois. They winter principally on the seacoast of Maryland, Virginia, and the Carolinas, where thousands of them are annually

killed. Of upland game-birds those most prized are the wild turkey, several species of grouse, snipe, and plovers, and the quail, all of which are widely distributed. Owing to the rapid growth of population in the United States, and the consequent increase in the number of sportsmen and market hunters, game of all kinds is being rapidly exterminated, and only by the enactment and strict enforcement of protective game laws can it be saved from total extinction. In many of the States such laws have been passed, and where properly executed the result has been of a gratifying character.

GAME LAWS are legislative enactments for the prevention of indiscriminate slaughter (particularly during the breeding seasons) and consequent extinction of wild or game animals, such as are not in themselves noxious and dangerous as beasts of prey; and are also designed to prevent the encroachment or poaching by one party upon the preserves or land of another. Nearly every State in the Union has its code of game laws, declaring the open and close seasons, and defining what animals or birds are or are not game.

GAMES. The public games of Greece and Rome were athletic contests and spectacles of various kinds, generally connected with and forming part of a religious observance. Probably no institution exercised a greater influence in molding the national character, and producing that unique type of physical and intellectual beauty which we see reflected in Greek art and literature, than the public contests of Greece. For them each youth was trained in the gymnasium, they were the central mart whither poet, artist, and merchant each brought his wares, and the common ground of union for every member of the Hellenic race. It is to Greece then that we must look for the earliest form and the fullest development of ancient games, and we propose in the present article to treat principally of the Greek *ἀγῶνες*. The shows of the Roman circus and amphitheater were at best a shadow, and in the later days of the empire a travesty, of the Olympia and Pythia, and require only a cursory notice. "Corruptio optimi fit pessima." From the noblest spectacle in the world, the Greek Olympia, the downward course of public games can be traced, till we reach the ignoblest, the Roman amphitheater, of whose horrors we may still form a faint picture from its last survival, the Spanish bull-fight.

The earliest games of which we have any record are those at the funeral of Patroclus, which form the subject of the twenty-third Iliad. The Olympian games were the earliest, and to the last they remained the most celebrated of the four national festivals. Olympia was a naturally inclosed spot in the rich plain of Elis, bounded on the north by the rocky heights of Kronos, and on the south and west by the Alpheus and its tributary the Kladeus. In 776 B.C. the Eleians engraved the name of their countryman Coroebus as victor in the foot-race, and thenceforward we have an almost unbroken list of the victors in each succeeding Olympiad or fourth recurrent year. For the next fifty years no names occur but those of Eleians or their next neighbors. After 720 B.C. we find Corinthians and Megareans, and later still Athenians and extra-Peloponnesians. Thus what at first was nothing more than a village bout became a bond of union for all branches of the Doric race, and grew in time to be the high feast to which every Greek gathered, from the mountain fastnesses of Thessaly to the remotest colonies of Cyrene and Marseilles. It survived even the extinction of Greek liberty, and had nearly completed twelve centuries when it was abolished by the decree of the Christian emperor Theodosius, in the tenth year of his reign. The last Olympian victor was a Romanized Armenian named Varastad.

At these quadrennial gatherings people assemble from every part of Greece. Along the "holy road" from the town of Elis there is crowding a motley throng. Conspicuous in the long train of pleasure-seekers are the sacred deputies, clad in their robes of office, and bearing with them in their carriages of state offerings to the shrine of the god. Nor is there any lack of distinguished visitors. It may be Alcibiades, who, they say, has entered no less than seven chariots; or the sophist Hippias, who boasts that all he bears about him, from the sandals on his feet to the dithyrambs he carries in his hand, are his own manufacture; or Aetion, who will exhibit his picture of the *Marriage of Alexander and Roxana*—the picture which gained him no less a prize than the daughter of the Hellenodices Praxonides; or, in an earlier age, the poet-laureate of the Olympians, Pindar himself. Lastly, as at the mediæval tournament, there are "store of ladies whose bright eyes rain influence"; matrons, indeed, are excluded on pain of death, but maidens, in accordance with Spartan manners, are admitted to the show.

At daybreak the athletes presented themselves in the Bouleuterion, where the presidents were sitting, and proved by witnesses that they were of pure Hellenic descent, and had no stain, religious or civil, on their character. Laying their hands on the bleeding victim, they swore that they had duly qualified themselves by ten months' continuous training in the gymnasium, and that they would use no fraud or guile in the sacred contests. Thence they proceeded to the stadium, where they stripped to the skin and anointed themselves. A herald proclaimed: "Let the runners put their feet to the line," and called on the spectators to challenge any disqualified by blood or character. If no objection was made, they were started by the note of the trumpet, running in heats of four, ranged in the places assigned them by lot. The presidents seated near the goal adjudged the victory. The foot race was only one of twenty-four Olympian contests which Pausanias enumerates, though we must not suppose that these were all exhibited at any one festival. Till the seventy-seventh Olympiad all was concluded in one day, but afterward the feast was extended to five. The order of the games is for the most part a matter of conjecture, but, roughly speaking, the historical order of their institution was followed.

The *Pythian* games, second only to the Olympian in importance, were founded after the first Sacred War out of the spoils of Cirrha, 595 B.C. The prizes were a wreath of laurel and a palm.

The *Nemean* games, originally a warlike gathering and review, were held in honor of Nemean Zeus at the grove of Nemea, between Cleonæ and Phlius, in the second and fourth year of each Olympiad. They date from about 570 B.C. The prize was a chaplet of parsley.

The *Isthmian* games, founded a little earlier than the Nemean, partook at first of the nature of mysteries. They were held on the narrowest part of the Isthmus of Corinth in honor of Poseidon in the first and third year of each Olympiad. Their prize was a wreath of pine leaves. The importance of the Isthmian games in later times is shown by the fact that Flamininus chose the occasion for proclaiming the liberation of Greece, 196 B.C.

The *Ludi Publici* of the Romans included feasts and theatrical exhibitions as well as the public games with which alone we are concerned. As in Greece, they were intimately connected with religion. At the beginning of each civil year it was the duty of the consuls to vow to the gods games for the safety of the commonwealth, and the expenses were defrayed by the treasury. Thus, at no cost to themselves, the Roman public were enabled to indulge at the same time their religious feel-

ings and their love of amusement. Their taste for games naturally grew till it became a passion, and under the empire games were looked upon by the mob as one of the two necessities of life. The ædiles who succeeded to this duty of the consuls were expected to supplement the state allowance from their private purse. Political adventurers were not slow to discover so ready a road to popularity, and what at first had been exclusively a state charge devolved upon men of wealth and ambition. A victory over some barbarian horde or the death of a relation served as the pretext for a magnificent display. But the worst extravagance of private citizens was eclipsed by the reckless prodigality of the Cæsars, who squandered the revenues of whole provinces in catering for the mob of idle sight-seers on whose favor their throne depended. But though public games played as important a part in Roman as in Greek history, and must be studied by the Roman historian as an integral factor in social and political life, yet, regarded solely as exhibitions, they are comparatively devoid of interest, and we sympathize with Pliny, who asks his friend how any man of sense can go day after day to view the same dreary round of fights and races.

It is easy to explain the different feelings which the games of Greece and of Rome excite. The Greeks at their best were actors, the Romans from first to last were spectators. It is true that even in Greek games the professional element played a large and ever-increasing part. As early as the sixth century B.C., Xenophanes complains that the wrestler's strength is preferred to the wisdom of the philosopher, and Euripides, in a well-known fragment, holds up to scorn the brawny, swaggering athlete. But what in Greece was a perversion, and acknowledged to be such, the Romans not only practiced, but held up as their ideal. No Greek, however high in birth, was ashamed to compete in person for the Olympic crown. The Roman, though little inferior in gymnastic exercises, kept strictly to the privacy of the palaestra; and for a patrician to appear in public as a charioteer, is stigmatized by the satirist as a mark of shameless effrontery.

Roman games are generally classified as *fixed*, *extraordinary*, and *votive*.

For the Roman world, the circus was at once a political club, a fashionable lounge, a rendezvous of gallantry, a betting ring, and a playground for the militia. Juvenal, speaking loosely, says that in his day it held the whole of Rome; and there is no reason to doubt the precise statement of P. Victor, that in the circus Maximus there were seats for 350,000 spectators.

GAMES, GAMING. Looking at these in their legal aspects, it will be seen that from very early times the law has attempted to exercise some control over the sports and pastimes of the people—particularly those involving an element of gambling. Certain games were either prohibited altogether, or reserved for people of some position in society. The efforts of modern legislation have been confined to the suppression of those games which are either dangerous to life or limb, or else contain within themselves the elements of gambling. In nearly all civilized countries this is the status of affairs, the law not interfering except to preserve the health, safety or morals of its subjects. In the different countries, notably in Russia, there may occasionally arise exigencies which seem to demand the suppression of certain games as having a political effect but such occasions are rare.

GANDERSHEIM (in Eberhard's Chronicle, Gandersheim), a town of Germany at the head of a circle in the duchy of Brunswick, situated on the Gande, a tributary of the Weser, about forty-eight miles south west of Brunswick. Population, 3,000.

GANDIA, an ancient wall-encircled city of Spain, in the province and archbishopric of Valencia, is beautifully situated in the fertile huerta or garden of Gandia, about three miles from the mouth of the river Alcoy.

GANDO, a kingdom of northwestern Africa in the Sudan, comprising that part of the territory watered by the Quorra or Niger which extends from the Birni and Say in the north to Idda in the south.

GANGANELLI. See CLEMENT XIV.

GANGES, a river of northern India, formed by the drainage of the southern ranges of the Himálayas. This mighty stream, which in its lower course supplies the great river system of Bengal, rises in the Garhwál state, and falls into the Bay of Bengal after a course of 1,500 miles. It issues, under the name of the Bhágirathí, from an ice cave at the foot of an Himálayan snow bed near Gangotri, 10,300 feet above the level of the sea. During its earlier passage through the southern spurs of the Himálayas, it receives the Jahnvi from the northwest, and subsequently the Alaknanda, after which the united stream takes the name of the Ganges. Deo Prayág, their point of junction, is a celebrated place of pilgrimage, as is also Gangotri, the source of the parent stream. At Sukhi it pierces through the Himálayas, and turns southwest to Hardwar, also a place of great sanctity. It proceeds by a tortuous course through the districts of Dehra Dún, Saháranpur, Muzaffarnager, Bulandshahr, and Farrukhabad, in which last district it receives the Rámgangá. Thus far the Ganges has been little more than a series of broad shoals, long deep pools, and rapids, except, of course, during the melting of the snows and throughout the rainy season. At Allahábád, however, it receives the Jumna, a mighty sister stream, which takes its rise also in the Himálayas to the west of the sources of the Ganges. The combined river winds eastward by south-east through the Northwestern Provinces, receiving the Gumti and the Gográ. The point of junction of each of these streams has more or less pretension to sanctity. But the tongue of the land at Allahábád, where the Jumna and the Ganges join, is the true Prayág, the place of pilgrimage, to which hundreds of thousands of devout Hindus repair to wash away their sins in the sacred river. Shortly after passing the holy city of Benares, the Ganges enters Behar, and after receiving an important tributary, the Son, from the south, passes Patná, and obtains another accession to its volume from the Gandak, which rises in Nepál. Further to the east, it receives the Kusí, and then, skirting the Rájmahál hills, turns sharply to the southward, passing near the site of the ruined city of Gaur. By this time it has approached to within 240 miles, as the crow flies, from the sea. About twenty miles further on, it begins to branch out on the level country, and this spot marks the commencement of the delta, 220 miles in a straight line, or 300 by the windings of the river, from the Bay of Bengal. The main channel takes the name of the Padma or Padda, and proceeds in a southeasterly direction, past Pábná to Goalandá, above which it is joined by the Jamuná or main stream of the Brahmaputra. The vast confluence of waters rushes toward the sea, receiving further additions from the hill country on the east, and forming a broad estuary known under the name of Meghná, which enters the Bay of Bengal near Noakháli. This estuary, however, is only the largest and most easterly of a great number of mouths or channels. The most westerly is the Húglí or Hooghly which receives the waters of a number of distributary channels that start from the parent Ganges in the neighborhood of Murshidábád. Between the Húglí on the west and the Meghná on the east lies the delta.

GANGI, a town of Italy, in the province of Palermo, and circondario of Cefalu, about twenty-three miles inland from the town of Cefalu. Population, 13,300.

GANGOTRI, a celebrated place of Hindu pilgrimage, situated among the Himálaya mountains, in the state of Gárhwal, on the Ganges, which is here not above fifteen or twenty yards broad, with a moderate current, and not in general above three feet deep.

GANGPUR, a tributary state of Chutiá Nágpur, Bèngal. Population about 75,000.

GANGRENE. See MORTIFICATION.

GANILH, CHARLES, a distinguished political economist, was born at Allanche in Cantal, on January 6, 1758. He died in 1836. Ganilh is best known as the most vigorous defender of the mercantile school in opposition to the views of Adam Smith and the English economists.

GANJAM, a district of Madras. The district is exceedingly mountainous and rocky, but is interspersed with open valleys and fertile plains. Pleasant groves of trees in the plains give to the scenery a greener and less Indian appearance than is usually met with in the districts to the south. Population, 1,600,000.

Ganjam formed part of the ancient kingdom of Kalinga. Its early history is involved in obscurity, and it was not until after the Gajapati dynasty ascended the throne of Orissa, that this tract became even nominally a part of their dominions.

GANNAL, JEAN NICOLAS, a distinguished French technical chemist, was born at Sarre-Louis, July 23, 1791. He was the first to introduce into printing the use of elastic rollers, which he formed by a mixture of gelatine and sugar, and his process for the melting of tallow, and hardening it with acids, prepared the way for the manufacture of wax-candles. In 1823, he took out a patent for the making of glue and gelatine. He obtained one of the Monthyon prizes of the Institute in 1827 for the employment of chlorine in the treatment of catarrh and phthisis, and again, in 1835, for his discovery of the efficacy of the injections of solutions of acetate and chloride of aluminium in preserving anatomical preparations. Turning his attention next to embalming, he showed that it could be accomplished without mutilation of the body, and with greater economy than after the old methods, by injecting into one of the carotid arteries solutions of aluminium salts. Gannal died at Paris in 1852.

GANNAT, a town of France, capital of an arrondissement in the department of Allier, is situated on the Anelot, an affluent of the Allier, thirty-three miles south-by-west of Moulins. Population, 6,000.

GANNET (Anglo-Saxon, *ganot*), or **SOLAN GOOSE**, the *Pelecanus bassanus* of Linnaeus, and the *Sula bassana* of modern ornithologists, a large sea-fowl, long known as a numerous visitor, for the purpose of breeding, to the Bass Rock, at the entrance of the Firth of Forth, and to certain other islands off the coast of Britain, of which four are in Scottish waters — namely, Ailsa Craig, at the mouth of the Firth of Clyde; the group known collectively as St. Kilda; Suleskerry, some forty miles northeast of the Butt of Lewis; and the Stack and Skerry, about the same distance westward of Stromness. On the western side of the Atlantic it appears to have but five stations, one in the Bay of Fandy, and four rocks in the Gulf of St. Lawrence. On all these seventeen places the bird arrives about the end of March or in April, and departs in autumn, when its young are ready to fly; but even during the breeding-season many of the adults may be seen on their fishing excursions at a vast distance from their home, while at other times of the year their range is greater still, for they not only frequent the North Sea and the English Channel, but

stray to the Baltic, and, in winter, extend their flight to the Madeiras, while the members of the species of American birth traverse the ocean from the shores of Greenland to the Gulf of Mexico.

Apparently as bulky as a goose, and with longer wings and tail, the gannet weighs considerably less. The plumage of the adult is white, tinged on the head and neck with buff, while the outer edge and principal quills of the wing are black, and some bare spaces round the eyes and on the throat reveal a dark blue skin. The first plumage of the young is of a deep brown above, but paler beneath, and each feather is tipped with a triangular white spot. The nest is a shallow depression, either on the ground itself or on a pile of turf, grass, and seaweed—which last is often conveyed from a great distance.

GANS, EDWARD, a distinguished jurist, was born at Berlin, on March 22, 1798. He attended Hegel's lectures at Berlin and became thoroughly imbued with the principles of the Hegelian philosophy. In 1825 he traveled for some months in England and France, and on his return was named professor extraordinarius at Berlin. At this period the historical school of jurisprudence was coming to the front, and Gans, already, from his Hegelian tendencies, predisposed to treat law historically, applied the method to one special branch of legal relations—the right of succession. He died in 1839. Gans edited the *Philosophie der Geschichte* in Hegel's *Werke*, and contributed an admirable preface.

GANSBACHER, JOHANN BAPTIST, a musical composer of repute, was born in 1778 at Sterzing in Tyrol. He creditably filled the responsible and difficult post of director of the music at St. Stephen's Cathedral, Vienna, from 1823 till his death (July 13, 1844); and his compositions betray the musician of high gift and accomplishment. They consist chiefly of church music, not less than seventeen masses, besides litanies, motets, offertories, etc., being among the number. He also wrote several sonatas, a symphony, and one or two minor compositions of a dramatic kind.

GANYMEDE affords a typical example of the manner in which myth-making continued as a living process through the whole of Greek history. In the thought of the primitive Indo-Germanic race occupied with the simplest cares of living, a very frequent subject was naturally the rain; and their thought has been preserved to us in the form of mythology. As the rain descends to earth it is the chief blessing to men, while in the clouds it gladdens the dwellers there. Hence arises the idea of a drink for the gods—the soma of the Hindus, the meth of the Norsemen, and the nectar of the Greeks—which plays such an important part in the *Rig Veda*, the *Edda*, and the Homeric poetry. The guardian and giver of the divine drink occurs in many forms, sometimes as a bird, sometimes as a divine being. Just as the eagle brings nectar to Zeus in Crete, so Odin takes the form of an eagle to steal the meth from Guttung for the use of the gods. The same divinity that in heaven distributes the drink to the gods is on earth the genius that presides over the due supply of water. Hence among the Greeks Ganymede, as the genius is called, exists in heaven as the Aquarius of the zodiac, while on earth he is, as Pindar tells, the genius of the fountains of the Nile, which was *par excellence* the life-giving and fertilizing river of the earth.

But the form under which the Ganymede myth most commonly appears has its origin in Asia Minor and in Crete. Homer says that Ganymede was a son of Tros, and that the gods on account of his beauty carried him off to heaven to dwell among the immortals and pour out the wine for Zeus. The *Little Iliad* again makes him the son of Laomedon, and says that Zeus gave his

father a golden vine in exchange for him. In the Trojan Ganymede there is not much trace left of the old kindly genius who distributes the blessings out of the clouds. We may indeed, when we remember that the Greeks admired personal beauty as almost divine, be able to see in this translation the good genius returning alive to heaven after his sojourn on earth, an idea that occurs in the mythology of almost every race. But now he seems rather to represent the everlasting youth and beauty that attend on the gods, and to be the male counterpart of Hebe, who was worshiped in Philus under the name Ganymede.

GAP (the ancient *Vapincum*), a town of France, capital of an arrondissement and also of the department of Hautes Alpes, is situated on the right bank of the Luye, forty-six miles southeast of Grenoble.

GARAT, DOMINIQUE JOSEPH, was born at Bayonne September 8, 1749. After receiving a good education under the direction of a relation who was a curé, he came to Paris, where he obtained introductions to the most distinguished writers of the time, and became a contributor to the *Encyclopédie Méthodique* and the *Mercur de France*. He gained considerable reputation by an éloge on L'Hôpital in 1778, and was afterward three times crowned by the Academy for éloges on Suger, Montausier, and Fontenelle. In 1785 he was named professor of history at the Atheneum, where his lectures enjoyed an equal popularity with those of Laharpe on literature. Being chosen a deputy to the states-general in 1789, he rendered important service to the popular cause by his narrative of the proceedings of the assembly contributed to the *Journal de Paris*. Possessing strongly optimistic views, a mild and irresolute character, and indefinite and changeable convictions, he played a somewhat undignified part in the great political events of the time, and became a pliant tool in carrying out the designs of others. He succeeded Danton as minister of justice in 1792, and in this capacity had intrusted to him what he called the *commission affreuse* of communicating to Louis XVI. his sentence of death. In 1793 he became minister of the interior, and during the Reign of Terror he was imprisoned, but he received his liberty after the revolution of the 9th Thermidor, and was named minister of public instruction. In 1798 he was appointed ambassador to Naples, and in the following year he became a member of the Council of the Ancients. After the revolution of the 18th Brumaire, he was chosen a senator by Napoleon and created a count. During the Hundred Days he was a member of the chamber of representatives, and strongly opposed the recall of the Bourbons. In 1803 he was chosen a member of the Institute of France, but after the restoration of Louis XVIII. his name was, in 1816, deleted from the list of members. After the revolution of 1830 he was named a member of the new Academy of Moral and Political Science. He died at Ustaritz near Bayonne, April 25, 1853.

GARAT, PIERRE-JEAN, one of the most famous singers of his time, nephew of the former, was born at Ustaritz, April 25, 1764. Gifted with a voice of exceptional timbre and compass, he devoted himself, from an early age, to the cultivation of his musical talents. After the revolution he became a professional singer, and on account of a song which he had composed in reference to the misfortunes of the royal family he was thrown into prison. On regaining his liberty he went to Hamburg, where he at once achieved extraordinary success; and by his subsequent appearances in Paris, and his visits to Italy, Spain, Germany, and Russia, he made for himself a reputation as a singer unequalled by any other of his own time. He was a keen partisan of the composer Gluck in opposition to Handel. On the

institution of the Conservatoire de Musique, he became its professor of singing. He is also the composer of a number of songs, many of which have considerable merit. He died March 1, 1823.

GARAY, JÁNOS, Hungarian poet and author, was born October 10, 1812, at Szegzárd, in the county of Tolna. From 1823 to 1828 he studied at Fünfkirchen, and subsequently, in 1829, at the university of Pesth. Here, having become acquainted with the works of the best German authors, he devoted himself to literary pursuits, and in 1834 brought out an heroic poem, in hexameters, under the title *Csatár*. After this he issued in quick succession various historical dramas, among which the most successful were *Arbócz*, *Orságh Ilona*, and *Báthori Erzsébet*. In 1848 Garay was nominated professor of Hungarian language and literature to the university of Pesth, but in the following year he resigned that post. In 1850 he became enfeebled in health, and at length unfit for further literary efforts. After about four years' illness, he died on November 5, 1853, in great want, in the forty-second year of his age. A collective edition of his poems was published at Pesth the year after his death.

GARBO, RAFFAELLINO DEL, a Florentine painter, was born in 1466; died in 1524. His real name was Raffaello Capponi; Del Garbo was a nickname, bestowed upon him seemingly from the graceful nicety (*garbo*) of his earlier works. He was a scholar of Filippino Lippi, with whom he remained till 1490, if not later. He showed great facility in design, and excited hopes which the completed body of his works fell short of. Three of his best tempera pictures are in the Berlin Gallery; one of the Madonna standing with her Infant between two musician-angels, is particularly attractive.

GARCAO, PEDRO ANTONIO CORREA, Portuguese lyric and dramatic poet, was born in the neighborhood of Lisbon on April 24, 1724. Almost nothing of his biography is known except that he lived a life of quiet domesticity and learned leisure, in a rural retreat at Fonte-Santa near the capital, till about his forty-sixth year, when he was imprisoned on an obscure charge believed to have arisen out of some expressions in his writings that had given offense to a despotic government. After languishing in confinement for eighteen months, he was released by death on November 10, 1772. His works, which include sonnets, odes, satires, and epistles, as well as dramatic pieces, were published for the first time in a collected form in 1778.

GARCIA, MANOEL, or, in full, Manoel Garcia del Popolo Vicente, was born in 1775 at Seville. He began artistic life as chorister at the cathedral of Seville, and simultaneously studied music under the best masters of his native city. At the age of seventeen he made his début on the stage at Cadiz, in an operetta of his own composition. Soon afterward he appeared at Madrid in his twofold capacity of singer and composer. His reputation being thus established, he proceeded to Paris, where he appeared for the first time, in 1808, in Paer's opera *Griselda*. Here also he was received with great applause, his style of singing being especially appreciated. This he further improved by careful study of the Italian method in Italy itself, where he continued his successes. His opera, *The Caliph of Bagdad*, was favorably received at Naples in 1812, but his chief successes were again due to his perfection as a vocalist. In 1824 he went to London, and thence proceeded to America (1825) with a company of excellent artists, among whom were his son Manoel and his daughter Maria, better known under her subsequent name of Malibran. He extended his artistic tour as far as Mexico, and was on the point of returning to Europe in order to retire from public life, when he was

robbed of his well-earned wealth by brigands on his way to Vera Cruz. Settled again in Paris, he soon retired from the stage, and devoted himself exclusively to teaching. He died in 1832.

GARCILASO DE LA VEGA, soldier and poet, was born at Toledo in 1503. At the age of seventeen he received a military appointment as a "contino" or guardsman to Charles V., and in that capacity took part in the war against the insurgent comuneros, having been present at the battle of Olias near Toledo, where he received a wound in the face. Being with Charles in the neighborhood of Fréjus during the retreat from Marseilles, Garcilaso de la Vega was ordered to silence a small fort at the village of Muy, which had been harassing the movements of the army. In the successful discharge of this duty he received a wound on the head which, twenty-one days afterward, at Nice, proved fatal (October 14, 1536).

GARCILASO INCA DE LA VEGA, historian of ancient Peru, was born at Cuzco in 1540. His father was a cadet of the illustrious family of La Vega, who had gone to Peru in the suite of Pedro de Alvarado, soon after the conquests of Pizarro; his mother was of the Peruvian blood-royal, a circumstance of which he was not a little proud, as giving a right to the title which he claimed by invariably subscribing himself "Inca." In 1560 he removed to Spain, and, having entered the military service, was engaged in the wars against the Moors and Turks. Disappointed in the inadequate recognition of his services by the crown, he retired while still a young man into private life at Cordova, where he gave himself to literature, and produced the learned historical work by which he is now known, the *Comentarios Reales que tratan del Origen de los Yncas, reyes que fueron del Peru, de su Idolatria, Leyes, etc.; con la Historia general de Peru*. The first part was published in 1609, and the second within a few months of his death, which occurred in 1616.

GARD, a department in the south of France, consisting of part of the old province of Languedoc, is bounded north by the departments of Lozère and Ardèche, east by the Rhone, which separates it from Vaucluse and Bouches-du-Rhône, south by Hérault and the Mediterranean and west by Aveyron. Pop., 418,470.

GARDA, LAKE OF, the Italian LAGO DI GARDA and ancient *Benacus*, the largest and most eastern of the great lakes of northern Italy. It is inclosed by Alpine ridges on both sides, except toward the south, where it widens out into the Lombard plain. The northern extremity belongs to the Austrian district of Tyrol, while the remainder is divided between the two old Italian provinces of Venetia and Lombardy. The length of the lake is about thirty-eight miles; its width varies from two or three miles in the north to eleven or twelve in the south; and its area is estimated at one hundred and thirty-five square miles. The ordinary elevation of the surface above the level of the sea is three hundred and twenty feet, but this is increased by three or five feet by the melting of the Alpine snows at the beginning of summer. The greatest depths are about nine hundred or one thousand feet. At the northern extremity it receives the waters of the Sarca, a comparatively small Tyrolean stream, and at the southeastern corner, at Peschiera, its surplus is conveyed by the Mincio to the Po. Navigation on the one hand is frequently rendered dangerous by sudden bursts of storm, while on the other hand it is facilitated by the two regular winds called the Ora or Andar and the Sover, of which the former blows from the south from midday to midnight, and the latter from the north from midnight to midday.

GARDAIA, or GHARDAYA (in the local documents

Taghardeit), a town of North Africa in the Algerian Sahara, situated on a hill in the middle of the Wadi Mezab, on the route between Morocco and Tripoli, about thirty-six miles west-northwest of Wargla, at a height of 1,755 feet above the sea-level.

GARDELEGEN (formerly GARDELEBEN and GARDELEBEN), the chief town of a circle in the government district of Magdeburg, Prussian Saxony, is situated on the right bank of the Milde, twenty-eight miles north-northwest of Magdeburg. Population, 6,600.

GARDE NATIONALE, the burgher defenders of order in Paris and certain other French towns, was first introduced into Paris during the Revolution of 1789, having been at first employed to defend the rights and privileges of the city, and subsequently to guard the persons and property of the citizens. It acted a conspicuous part in the Revolution, its sympathies and support being given to first one party and then another. In 1794 it was among the most devoted adherents of Robespierre and his bloody triumvirate, ever ready to lend its aid in the execution of their merciless decrees. Later in the year, when the Reign of Terror stood balanced between power and death, the National Guard proved, under the command of Barras, faithful to the Convention, which had deposed Robespierre and his colleagues. In 1795 the National Guard aided in the disarmament of the populace. Not many months after the corps became Royalist in its feelings, carrying its sympathies at length to open rebellion against the Convention; but it sustained an utter defeat from a small body of troops of the regular army, who, under Barras and Bonaparte, defeated the Convention. After this reverse the National Guard ceased practically to exist. In 1805, Napoleon re-instituted the Garde Nationale, taking care that no elective or democratic principles should pervade the body. From that time it led a precarious existence through the political changes that have made the history of modern France, and in 1871, the French National Assembly decreed to dissolve it, leaving the prefects of departments to choose the time of executing the decree, and at present this body may be considered abolished.

GARDENIA, a genus of trees and shrubs, of the natural order *Cinchonaceae*, natives of tropical and sub-tropical countries, many of which are favorites on account of their beautiful and fragrant flowers. Some of them are hardy enough to endure the open air in summer. The corolla is funnel-shaped, or approaching to salver-shaped, the tube much longer than the calyx; the fruit is a berry crowned with the calyx. *G. florida* and *G. radicans* are among the species best known, and bear the name of Cape jasmine, but are natives of Japan.

GARDENING. See HORTICULTURE.

GARDINER, a city in Kennebec county, Me., is situated at the junction of the Kennebec and Cobscook rivers, ten miles south by east of Augusta. The water-power of the Cobscook river is much utilized for manufactures, and the town has saw-mills, paper-mills, iron foundries, a woolen factory, a tannery, a pottery, and manufactories of sashes and blinds, and is the headquarters of the ice-business on the Kennebec. Population (1900), 5,501.

GARDINER, COLONEL JAMES, a Scottish soldier, was born at Carriden in Linlithgowshire, January 10, 1687. At the age of fourteen he entered a Scottish regiment in the Dutch service, and was afterward present at the battle of Ramillies, where he was wounded. He subsequently served in different cavalry regiments, and in 1730 was advanced to the rank of lieutenant-colonel, and in 1743 to that of colonel. He fell at the battle of Prestonpans, September 1, 1745. The circumstances of his death are described in Sir Walter Scott's

novel of *Waverley*. Gardiner in his youth was notorious for his licentiousness, but in 1719 became a Christian, in consequence of a vision.

GARDINER, STEPHEN, bishop of Winchester and lord chancellor of England, was born at Bury St. Edmunds in 1483. He is believed to have been the illegitimate son of Dr. Woodville, bishop of Salisbury, brother of Elizabeth Woodville, queen of Edward IV. If so, he lost his father when he was only one year old; but his education seems to have been carefully provided for. He was sent to Cambridge and studied at Trinity Hall, where he greatly distinguished himself in the classics, especially in Greek. He afterward devoted himself to the canon and civil law, in which subjects he attained so great a proficiency that no one could dispute his preëminence. He received the degree of doctor of civil law in 1520, and of canon law in the following year. Ere long his abilities attracted the notice of Cardinal Wolsey, who made him his secretary, and in this capacity he is said to have been with him at More Park in Hertfordshire, when the conclusion of the celebrated treaty of the More brought Henry VIII. and the French ambassadors thither. It is stated, and with great probability, that this was the occasion on which he was first introduced to the king's notice, but he does not appear to have been actively engaged in Henry's service till three years later. In that of Wolsey, he undoubtedly acquired a very intimate knowledge of foreign politics, and in 1527 he and Sir Thomas More were named commissioners on the part of England in arranging a treaty with the French ambassadors for the support of an army in Italy against the emperor. That year he accompanied Wolsey on his important diplomatic mission to France. Among the imposing train who went with the cardinal—including, as it did, several noblemen and privy councillors—Gardiner alone seems to have been acquainted with the real heart of the matter which made his embassy a thing of such peculiar moment. Henry was then particularly anxious to cement his alliance with Francis I.

It was owing to Gardiner's vigorous advocacy that the celebrated commission was issued to Cardinals Wolsey and Campeggio to try the cause in England. After obtaining it he was recalled, but early in the following year, 1529, as Campeggio delayed proceeding, he was sent once more to Rome. This time, however, his efforts were unavailing. The pope would make no further concessions, and would not even promise not to revoke the cause to Rome, as he did very shortly after. Gardiner's services, however, were fully appreciated. He was appointed the king's secretary. He had been already some years arch-deacon of Taunton, and the archdeaconry of Norfolk was added to it in March, 1529, which two years later he resigned for that of Leicester. In 1530 he was sent to Cambridge to procure the decision of the university as to the unlawfulness of marriage with a deceased brother's wife, in accordance with the new plan devised for settling the question without the pope's intervention. In this he succeeded, though not without a good deal of artifice, more creditable to his ingenuity than to his virtue. In November, 1531, the king rewarded him for his services with the bishopric of Winchester, vacant by Wolsey's death. It must be owned, however, that his next distinguished service was not a very creditable one; for he was, not exactly, as is often said, one of Cranmer's assessors, but, according to Cranmer's own expression, "assistant" to him as counsel for the king, when the archbishop, in the absence of Queen Catherine, pronounced her marriage with Henry null and void c. 1. May 23, 1533. Immediately afterward he was sent over to Marseilles, where an interview between the pope and

Francis I. took place in September, of which event Henry stood in great suspicion, as Francis was ostensibly his most cordial ally, and had hitherto maintained the justice of his cause in the matter of divorce. Here he intimated the appeal of Henry VIII. to a general council in case the pope should venture to proceed to sentence against him. He also made a like appeal in behalf of Cranmer. Next year he and other bishops were called upon to vindicate the king's new title of "Supreme Head of the Church of England." The result was his celebrated treatise *De Vera Obedientia*, the ablest, certainly, of all the vindications of royal supremacy. In 1535 he had an unpleasant dispute with Cranmer about the visitation of his diocese. During the next few years he was engaged in various embassies in France and Germany. He was, indeed, so much abroad that he had little influence upon the king's councils. But in 1539 he was much concerned in the drawing up and passing through the House of Lords of the severe statute of the Six Articles, which led to the resignation of Bishops Latimer and Shaxton and the persecution of the whole Protestant party. In 1540, on the death of Cromwell, earl of Essex, he was elected chancellor of the University of Cambridge. A few years later he attempted, in concert with others, to fasten a charge of heresy upon Archbishop Cranmer in connection with the act of the Six Articles; and, but for the personal intervention of the king, he would probably have succeeded. He was, in fact, though he had supported the royal supremacy, a thorough opponent of the Reformation in a doctrinal point of view, and it was suspected that he even repented his advocacy of the royal supremacy. He certainly had not approved of Henry's general treatment of the church, especially during the ascendancy of Cromwell, and he was frequently visited with storms of royal indignation, which he schooled himself to bear with patience. In 1544, a relation of his own, named German Gardiner, whom he employed as his secretary, was put to death for treason in reference to the king's supremacy, and his enemies insinuated to the king that he himself was of his secretary's way of thinking. But being warned of his danger, he sought an interview with Henry, in which he succeeded in clearing himself of all injurious imputations. That he was party to a design against Queen Catherine Parr, whom the king was at one time on the point of committing to the Tower, rests only upon the authority of Foxe, and seems a little doubtful. It is certain, however, that his name was omitted at the last in Henry's VIII.'s will, though the king was believed to have intended making him one of his executors.

Under Edward VI. Gardiner was completely opposed to the policy of the dominant party both in ecclesiastical and in civil matters. The religious changes he objected to both on principle and on the ground of their being moved during the king's minority, and he resisted Cranmer's project of a general visitation. His remonstrances, however, were met by his own committal to the Fleet, and the visitation of his diocese was held during his imprisonment. Though soon afterward released, it was not long before he was called before the council, and, refusing to give them satisfaction on some points, was thrown into the Tower, where he continued during the whole remainder of the reign, a period slightly over five years. During this time he in vain demanded his liberty, and to be called before parliament as a peer of the realm. His bishopric was taken from him and given to Doctor Poynt, a chaplain of Cranmer's, who had not long before been made bishop of Rochester. At the accession of Queen Mary, the duke of Norfolk and other state prisoners of high rank were in the Tower along with him; but the queen, on her first

entry into London, set them all at liberty. Gardiner was restored to his bishopric, and appointed lord chancellor, and he set the crown on the queen's head at her coronation. He also opened her first parliament, and for some time was her leading counselor. He was now called upon, at the age of seventy, to undo not a little of the work in which he had been instrumental in his earlier years—to vindicate the legitimacy of the queen's birth and the lawfulness of her mother's marriage, to restore the old religion, and to recant what he himself had written touching the royal supremacy. At least this, it may be presumed, was the time when he wrote, if, as we are told, he really did write, a *Palinodia* or retraction of his book *De Vera Obedientia*, which, however, does not seem to be now extant, so that how far he had changed his sentiments we cannot very well judge. That he should have really changed them to some extent is not at all unnatural; and in relation to the divorce of Catherine of Aragon, we may well believe that it was his earlier and not his later action that ever troubled his conscience. Yet as to the royal supremacy, it seems that he would have advised Queen Mary to retain it; but her own desire was so great to give up ecclesiastical jurisdiction to the pope that he could not press the matter. A less agreeable task which fell to him was the negotiation of the queen's marriage treaty with Philip, to which he shared the general repugnance, though he could not oppose her will. In executing it, however, he took care to make the terms as advantageous for England as possible, and to make express provision that the Spaniards should in no wise be allowed to interfere in the government of the country. After the coming of Cardinal Pole and the reconciliation of the realm to the see of Rome, his influence suffered some eclipse, though he still remained in high favor. How far he was responsible for the persecutions which afterward arose is a debated question. There is no doubt that he sat in judgment on Bishop Hooper, and several other Protestants whom he condemned to the flames. But being placed on a commission along with a number of other bishops to administer a severe law, it does not appear that he could very well have acted otherwise. On the bench he is said to have used every effort to induce the accused to make concessions and accept a pardon; and a remarkable instance of his clemency is recorded by the church historian Fuller, who, notwithstanding his prejudices, acknowledges a debt of gratitude to him for preserving one of his own ancestors from the persecuting zeal of others. It would seem, moreover, that when he saw the results of the cruel proceedings against heretics, he very soon got tired of them. The persecutions raged with the greatest vehemence during his absence at the Calais peace conferences in 1555, and when he came back he declared he would have no further hand in them, so that those afterward apprehended in his diocese were removed into that of London in order to be adjudged to the flames. In October, 1555, he again opened parliament as lord chancellor, but toward the end of the month he fell ill and grew rapidly worse till November 12th, when he died about the age of seventy-two.

GARDNER, a thriving town of Massachusetts, situated in Worcester county, having considerable commerce, railroad, banking and telegraph facilities, and a growing population—at present (1900) 10,813.

GARE-FOWL, the Anglicized form of the Hebrew name of a large sea-bird, formerly a visitor to certain remote Scottish islands, the GREAT AUK of most English book-writers, and the *Alca impennis* of Linnaeus. In size it was hardly less than a tame goose, and in appearance it much resembled its smaller and surviving relative the Razor-bill (*Alca torda*); but the glossy

black of its head was varied by a large patch of white occupying nearly all the space between the eye and the bill, in place of the Razor-bill's thin, white line, while the bill itself bore eight or more deep transverse grooves instead of the smaller number and the ivory-like mark possessed by the species last named. Otherwise the coloration was similar in both, and there is satisfactory evidence that the Gare-fowl's winter-plumage differed from that of the breeding-season just as is ordinarily the case in other members of the family *Alcidae* to which it belongs. The most striking characteristic of the Gare-fowl, however, was the comparatively abortive condition of its wings, the distal portions of which, though the bird was just about twice the linear dimensions of the Razor-bill, were almost exactly of the same size as in that species—proving, if more direct evidence were wanting, its inability to fly.

GARESSIO, GARESSO, or GAREZZO, in Latin *Garexium*, a town of Italy about eighteen miles south-east of Mondovì, in the valley of the Tararo. The Roman remains which are discovered from time to time bear witness to its high antiquity; during the Middle Ages it was the seat of a marquise, which in 1509 was sold to the Spinola family, and its double walls gave it some importance as a defensible position.

GAR-FISH is the name given to a genus of fishes (*Belone*) found in nearly all the temperate and tropical seas, and readily recognized by their long, slender, compressed and silvery body, and by their jaws being produced into a long, pointed, bony and sharply-toothed beak. About fifty species are known in different parts of the globe, some attaining a length of four or five feet. (See *ICHTHYOLOGY*.)

GARGANEY, or SUMMER-TEAL. About the same size as the common Teal, the male is readily distinguished therefrom by its peculiarly-colored head, the sides of which are nutmeg-brown, closely freckled with short whitish streaks, while a conspicuous white curved line descends backward from the eyes. The upper wing-coverts are bluish-gray, the scapulars black with a white shaft-stripe, and the wing-spot grayish-green bordered above and below by white. The female closely resembles the hen Teal, but possesses nearly the same wing-spot as her mate.

GARHWÁL, a district of British India, in the Kumaon division, under the jurisdiction of the lieutenant-governor of the North-Western Provinces.

GARLIC, *Allium sativum*, Linn., a bulbous perennial plant of the tribe *Hyacinthineae* of the natural order *Liliaceae*, indigenous apparently to the south of Europe and to the East. Garlic possesses stimulant and stomachic properties, and was of old, as still sometimes now, employed as a medicinal remedy. Pliny gives an exceedingly long list of complaints in which it was considered beneficial. Doctor Sydenham valued it as an application in confluent small-pox, and, says Cullen, found some dropsies cured by it alone. The volatile oil was proved efficacious in indigestion.

GARNET, a mineral, the name of which is derived from the Latin *granatum*, the pomegranate, or, as Lydgate calls it, "garnet appille," on account of the resemblance of its granular varieties to the seeds of that fruit. Garnet occurs in crystals, mostly dodecahedral or trapezohedral, very rarely octahedral, of the isometric, regular, or cubical system, also in pebbles and grains (as in alluvial deposits), and massive, with a granular or coarse lamellar structure. It varies in diaphaneity from transparent to nearly opaque; is red, red-brown, or black in color, less frequently white, yellow, pink or green; has a vitreous to resinous luster, a white streak, dodecahedral cleavage and an uneven sub-conchoidal fracture; and is brittle and somewhat friable,

or, in the compact cryptocrystalline varieties, tough. GARNIER, GERMAIN, an able writer on political economy, was born at Auxerre, on November 8, 1754. He died at Paris, October 4, 1821.

GARNIER, MARIE JOSEPH FRANCOIS, usually called Francis Garnier, a French officer and explorer, was born at St. Etienne, July 25, 1839, and perished by assassination in Tong-king, December 7, 1873.

GARNIER, ROBERT (1534-90), a French tragedian, the most distinguished of the predecessors of Corneille.

GAROFALO, BENVENUTO. See TISIO.

GARONNE, HAUTE, or UPPER GARONNE, is one of the frontier departments in the south of France, being continuous with Spain along the line of the Pyrenees. To the north lies the department of Tarn-et-Garonne, to the east are those of Tarn, Aude, and Ariège, and to the west those of Gers and Hautes-Pyrenees. The form of the department is very irregular. Its greatest length is ninety-nine miles from northeast to southwest, and its greatest breadth about fifty-six miles; but its area only amounts to 629,000 hectares, or 2,428 square miles. The northern portion is a fertile but mountainous stretch of country with continual interchange of hill and valley nowhere thrown into striking relief; while toward the south the land rises gradually to the Pyrenees, which there attain a height of upward of 11,000 feet. All the streams by which the department is watered—the Neste, the Salat, the Lers, the Logue, the Touche, etc.—belong to the system of the river from which it takes its name. Except in the mountainous region the climate is mild, the mean annual temperature being rather higher than that of Paris. The rainfall, which averages twenty-three inches at Toulouse and twenty-six at St. Gaudens, is distributed over 125 days. The winds are often violent. Thick forests of oak, fir, and pine exist in the mountains, and furnish timber for ship-building. The arable land (360,241 hectares, or 890,207 acres) is well adapted for the cultivation of wheat, maize, and other grain crops; and the produce of cereals is generally much more than is required for the local consumption. Oats, buckwheat, barley, flax, colza, and potatoes are all grown; fruit is plentiful, and about 54,000 hectares, or 133,441 acres, are occupied by vineyards, though the wine is only of medium quality. As pasture land is abundant, a good deal of attention is given to the rearing of cattle and sheep; and owing to the mountainous character of the southern region asses and mules are favorite beasts of burden, and may be estimated at 24,000 in number. Iron, lead, copper, and coal are among the mineral productions, as well as marble, both white and variegated, granite, freestone, lime, and slate. The manufactures are various though not individually extensive, and include iron and copper utensils, earthenware, woolen, cotton and linen goods, leather, paper, watches, mathematical instruments, etc. Railway communication is furnished by the line from Bordeaux to Cette, which passes by Toulouse, and there sends off branch lines leading to Albi, Auch, Foix, St. Giron, and Bagnères du Luchon. The Canal du Midi traverses the department for thirty two miles. There are four arrondissements—Toulouse, Villefranche, Muret, and St. Gaudens, subdivided into thirty-nine cantons and 585 communes. The chief town, Toulouse, contained 147,096 inhabitants in 1901; but there is no other town of even 5,000 in the department, the largest being St. Gaudens with 4,087. The population of Haute Garonne (1901) was 439,769.

GARONNE, the ancient *Garumna*, a river of southern France, which rises in the Spanish Pyrenees not far from the massif of Maladetta, flows through the fine gorge called the Val d'Aran, partly loses itself under the calcareous rocks that form the gulf of Clédes,

enters France near the Pont du Roi, and proceeds in a general northwest direction till it falls into the Bay of Biscay. Rafts can be sent down the river from the Spanish frontier; boats can pass with the stream from the confluence of the Salat to Toulouse; from Toulouse downward regular navigation with boats can be maintained; and seafaring vessels can sail up as far as Castets, thirty-two miles above Bordeaux. At Bec d'Ambes, near the confluence of the Dordogne, the river widens out to a breadth of from two to four miles, and takes the name of the Gironde. This estuary presents an almost uninterrupted succession of islands and banks, which divide it into nearly equal branches, and render the navigation somewhat difficult. At the mouth stands the famous tower of Cordouan, which dates from 1584-1610, and ranks as one of the finest lighthouses on the coast of France.

GARRICK, DAVID, the greatest actor of his age, and the most successful of English theatrical managers, was descended from a good French Protestant family of Bordeaux, which had settled in England on the revocation of the edict of Nantes. His father, Capt. Peter Garrick, was on a recruiting expedition when his celebrated son was born at Hereford on February 19, 1716-17. The captain usually resided at Lichfield on half pay, but, in order to benefit his large family, he accepted an offer to proceed on service to Gibraltar, in place of a brother officer who was desirous of returning to England. This kept him many years absent from home, and the letters written to him by "little Davy," acquainting him with the doings at Lichfield, are highly interesting memorials of the future Roscius. In his nineteenth year, after receiving a good education at the grammar school of Lichfield, David was sent to the establishment at Edial, opened in June or July, 1736, by Samuel Johnson, his senior by seven years. The Edial academy was shut in about six months, and on March 2, 1736-7, master and pupil, Johnson and Garrick, left Lichfield for London, the one to commence the study of the law, and the other to try his tragedy of *Irene*—Johnson, as he afterward said, "with twopence half-penny in his pocket," and Garrick "with three-half-penny in his." Seven days afterward, however, Garrick was entered of Lincoln's Inn, but after remaining for a few months in London, he resided for some time with Mr. Colson, a distinguished teacher at Rochester afterward Lucasian (professor at Cambridge). Captain Garrick, who had returned from Gibraltar, died about a month after his son's arrival in London. Soon afterward a rich uncle, a wine merchant at Lisbon, in his will left David a sum of £1,000, and he and his brother entered into partnership as wine merchants in London and Lichfield. The concern was not prosperous—though Foote's assertion that he had known Garrick with three quarts of vinegar in the cellar calling himself a wine merchant need not be taken literally—and before the end of 1741 he had spent nearly half of his £1,000. His passion for the stage completely engrossed him; he tried his hand both at dramatic criticism and at dramatic authorship, and made his first appearance on the stage late in 1740-1, *incognito*, as harlequin at Goodman's Fields, where Woodward, being ill, allowed him to take his place during a few scenes. When the manager of the same theater, Giffard, took a party of players to Ipswich, Garrick accompanied them, and there made his first essay as an actor under the name of Lyddal, in the part of the black "Aboan" (in Southerne's *Oroonoko*). His success on the provincial boards determined his future career. On October 19, 1741, he made his appearance at Goodman's Fields in the character of "Richard III.," and gained the most enthusiastic applause. His staid and sedate brother, and

his sisters at Lichfield, were scandalized at this derogation from the provincial dignity of the family; and Garrick, greatly distressed at the shock they had received by the intelligence (which, however, he expected) hasted to give up his interest in the wine company. Each night added to his popularity on the stage. He was received by the best company in town. While his "Richard" was still calling forth the general admiration, he won new applause in "Lear" and "Pierre," as well as in several comic characters (including that of "Bayes"). Glover ("Leonidas") attended every performance; Lyttelton, Pitt, and several other members of parliament had shown him the greatest civility. From December 2d he appeared in his own name. Pope went to see him thrice during his first performances, and pronounced that "that young man never had his equal as an actor, and he will never have a rival." Before next spring he had supped "with the great Mr. Murray, counselor," and hoped to do so with Mr. Pope through Murray's introduction, while he was dining with Halifax, Sandwich and Chesterfield. "There are a dozen of dukes of a night at Goodman's Fields," writes Horace Walpole. *The Lying Valet* being at this time brought out with success, the honors of dramatic author were added to those of the stage. His fortune was now made, and while the managers of Covent Garden and Drury Lane resorted to the law to make Giffard close his little theater, Garrick was engaged by Fleetwood for Drury Lane for the season of 1742. In the meantime, having very advantageous terms offered him for performing in Dublin during part of the summer, he went over to that city, where he found the same homage paid to his merit which he had received from his own countrymen. From September, 1742, to April, 1745, he continued at Drury Lane, after which he again went over to Ireland, and remained there the whole season, as joint manager with Sheridan, in the direction and profits of the theater royal in Smock Alley. From Dublin he returned to England, and fulfilled a short engagement in 1746-7, with Rich at Covent Garden. This was his last series of performances as a hired actor, for in the close of the season Fleetwood's patent for the management of Drury Lane expired, and Garrick, in conjunction with Lacy, purchased the property of the theater, together with the renovation of the patent, and in the winter of 1747 opened it with a strong company of actors, the prologue for the occasion being written by his old preceptor Johnson.

After about the year 1745, escaping from the chains of an unreturned passion for the beautiful but reckless actress "Peg" Woffington, Garrick had, in 1749, married Mademoiselle Violette (Eva Maria Veigal) a German lady who had attracted the admiration of the court of Vienna as a dancer, and was patronized in England by the countess of Burlington. This lady Garrick called "the best of women and wives," and he lived most happily with her in his villa at Hampton (acquired by him in 1754, and adorned by the famous Shakespeare temple), whither he was glad to escape from his house in Southampton street. Their union was childless, and Mrs. Garrick survived her husband, living in great respect until 1822. Having sold the moiety of his theater for £35,000, Garrick took leave of the stage by playing a round of his favorite characters—"Hamlet," "Lear," "Richard," "Lusignan," and "Kitey," as the graver; "Archer," "Abel Drugger," "Sir John Brute," "Benedick," "Leon," and "Don Felix," as those of a lighter cast. He ended the series with "Don Felix" (in *The Wonder*) on June 10, 1776. But he was not long to enjoy his opulent and well-earned repose, for he died in London on January 20, 1779. He was buried in Westminster Abbey with imposing solemnity.

ties, and amidst an unexampled concourse of people of all ranks.

*GARRISON, WILLIAM LLOYD, was the chief American anti-slavery agitator and leader of the Abolitionist party. His parents were of English extraction, and went from Nova Scotia to live at Newburyport, Massachusetts. There the subject of this sketch was born on December 10, 1805. In his childhood he was left fatherless, the elder Garrison disappearing during a voyage at sea and leaving the family destitute. The boy was cared for by his mother, a woman of fine mind and character, who became a professional nurse in order to maintain herself and children. His education was chiefly self-acquired, and at an early age he was compelled to go to work, at first in a shoemaker's shop, then in a carpenter's shop, and finally, when fourteen years old, in the printing office of a local paper, the *Newburyport Herald*. For the printer's trade he showed much aptitude, and in a year or two he mastered all its mechanical details. Then he began to write articles for publication. These were submitted anonymously to the editor of the *Herald* and were gladly printed by him without suspecting the authorship of them. Garrison was at this time only sixteen years old. A year later he began writing, also anonymously for the Salem (Mass.) *Gazette* and other papers. These utterances, which were chiefly upon the subject of slavery and its iniquity, attracted wide attention. Some of them, signed with a pen-name, were reprinted in other papers and were attributed to distinguished authorship. In time Garrison's employer learned what the lad was doing, gave him encouragement in his literary work, and entrusted him with the editorship of the paper for a time in 1824, during his own absence from home. Upon attaining his majority, Garrison left the *Herald* office and started a paper of his own in Newburyport, called, characteristically, the *Free Press*—a sheet ardently devoted to the cause of freedom for all men. This paper had a short career, but it was distinguished by its publication of the first printed poems of John Greenleaf Whittier. The poet was then only eighteen years old, and Garrison was twenty-one. The *Free Press* failed, however, and so did another paper started by Garrison in Vermont, and he was compelled to return to the case as a journeyman typesetter. He was employed in Boston, and there made the acquaintance of Benjamin Lundy, a Quaker philanthropist. A partnership was formed between them, and they went to Baltimore, there to publish an anti-slavery periodical. That city was a strong pro-slavery centre, and the reformers met with much antagonism. Finally a bitter attack made by Garrison upon the owners of a vessel that had been used for transporting slaves from one place to another led to his conviction of libel. He was fined \$50 and costs, and in default of payment was sent to jail. There he spent seven weeks, in which time he wrote upon the walls of his cell several stirring odes to liberty. Then his fine was paid by Arthur Tappan, a New York merchant and philanthropist, and he was released. He had not entirely agreed with Lundy, who was a man of more conservative and moderate views than the fiery Garrison, so they then parted company and Garrison began preparing, by means of lectures and otherwise, for the establishment of another paper of his own. This paper was the famous *Liberator*, and it was first published in Boston on January 1, 1831. It had no subscribers and was backed by no capital. It was written, set up and printed in a single unfurnished room, which was also the dwelling place of Garrison and his one comrade and assistant. But it quickly became a tremendous force. "I am in earnest," said Garrison. "I will not equivocate. I will not excuse. I will not retreat a single inch. And I will be heard!" He was heard, from the very first. His mail was laden with letters of denunciation, threatening him with violence and as-

sassination. But he persevered and his work prospered. In 1833, after a visit to England, he organized the American Anti-Slavery Society, which became a powerful organization. Garrison conducted the *Liberator* for thirty-five years, finally stopping it and disbanding the Anti-Slavery Society at the end of the Civil War, when the objects he had striven for were attained. His friends then presented to him a testimonial fund of \$30,000, which was most welcome, for his unselfish labors had left him a poor man. In 1867 he visited England, and was entertained at a public breakfast in St. James's Hall. He again went thither, privately, in 1877. He died in New York City on May 24, 1879. A bronze statue has been erected to his memory in Boston, where he was once mobbed, poems in his honor were written by Lowell, Whittier and others, and his works and various biographies of him have been widely published in this and other lands.

—W. FLETCHER JOHNSON.

GARROTE, an instrument devised for executing criminals. It is peculiarly Spanish in its adaptability to the infliction of torture and its constant use by the Spaniards in all of their colonies, especially in Cuba, was one of the provoking causes of the American war for humanity against that country. When the time fixed for an execution arrives, the victim is seated and leans his head back against a wooden beam prepared as a support. An iron collar closely encircles the throat, its rear end passing through the beam and uniting with a screw and lever at the back. The screw terminates in a sharp, needle-pointed projection, and by a sudden wrench of the lever this is forced through the back of the neck and into the spinal marrow, causing instant death. It is no longer in use in Cuba.

The origin of the garrote is traced back through the Moors to the Oriental punishment of the bowstring, which it exactly resembled in its primitive style. It was originally merely a cord put around the neck and suddenly tightened by the twisting of a stick between the cord and the back of the prisoner's head. Hence the name of this mode of execution, *garrote* in Spanish signifying stick. Subsequently the iron collar was introduced, and the neck of the victim broken by a sudden tightening of the band against the throat. At a still later period the sharp-pointed screw was added, and this form is still in use under Spanish rule.

GAS AND GAS-LIGHTING. All artificial light is obtained as a result either of combustion or of incandescence. The materials whence artificial light of the nature of flame has been derived are principally bodies rich in carbon and hydrogen.

Inflammable gas is formed in great abundance within the earth in connection with carbonaceous deposits, such as coal and petroleum; and similar accumulations not unfrequently occur in connection with deposits of rock-salt; the gases from any of these sources, escaping by means of fissures or seams to the open air, may be collected and burned in suitable arrangements. It is asserted that the Chinese used naturally evolved gas as an illuminant long before gas-lighting was introduced among European nations. At Fredonia, New York, a natural emission of gas was discovered in a bituminous limestone, over the orifice of which a gasholder has been erected, and thus about 1,000 cubic feet of a gas composed of marsh gas and hydride of ethyl has been made available for illumination. In the city of Erie (Pa.) there are thirteen gas-wells, each yielding from 10,000 to 30,000 feet per day, the gas escaping from one of them at a pressure of 200 pounds per square inch. At Bloomfield, New York, there is a spring which yields daily no less than 800,000 feet of gas of an illuminating power equal to fourteen and one-half candles. The city of East Liverpool (Ohio) is entirely illuminated, and to a large extent heated, by gas-wells which exist in and around the town. The light is of

extraordinary brilliancy, and is so abundant and free that the street lamps are never extinguished, and much of the manufacturing steam-power of the town, which embraces twenty-two potteries, giving employment to 2,000 hands, is derived from the gas. The first "well," 150 feet deep, was opened in 1859, and up to the present year neither it nor any of those tapped at later dates show any sign of failing. In Indiana and many other parts of America similar gas-wells exist; and several such natural jets of gas have been observed in England.

By general consent the merit of the discovery and application of artificial gas belongs to Great Britain, and the name most honorably connected with the beginning and early stages of gas-lighting is that of a Scotchman—Robert Murdoch. But previous to Murdoch's time there occurred numerous suggestive observations and experiments as to inflammable air and its sources.

Artificial gas is now distilled from a variety of substances, among which are coal, shale, lignite, petroleum, water, turf, wood, resins, oils, and fats; and it is also prepared by carbureting or impregnating with volatile hydrocarbons other non-luminiferous gases. Of the very numerous systems of gas-making which have been proposed since the early part of the century, none can compete for general purposes with the ordinary coal-gas process, when a supply of the raw material can be obtained at a moderate expense.

Coal-Gas.—Coals varying greatly as they do in chemical constitution, differ also, as might be expected, as widely in their value and applicability for the manufacture of gas. Taking the leading varieties of coal to be included under anthracite, bituminous coal, and lignite or brown coal, we find that it is the class bituminous coal alone that yields varieties really serviceable for gas-making. Anthracite may be regarded as a natural coke from which the volatile constituents have been already driven off, and the more anthracite any coal is, the less it is capable of yielding gas. Lignite is also rarely used for distillation, owing to the large proportion of oxygen and the amount of water in the composition. Of the bituminous coals again, it is only the coking or pitch coals, and the cannel or parrot coals, that are in practice used in gas-works. These also vary within very wide limits in their gas-making value, not only from the great difference among them in yield of gas, but also in the illuminating value of the gas they evolve. As a rule the coals which yield the largest percentage produce also the most highly illuminating qualities of gas.

The series of operations connected with the preparation and distribution of coal-gas embrace the processes of distillation, condensation, exhaustion, scrubbing or washing, purification, measuring, storing, and distribution by the governor to the mains, whence the consumer's supply is drawn. In connection with consumption, pressure of the gas, measurement of the amount consumed, and the burners and other arrangements for lighting are the most important considerations.

Retorts.—Retorts for destructive distillation of coal are formed of cast iron, clay, brick, or wrought iron. Various shapes have been adopted in the construction of these vessels; nor have their forms been more varied than the modes in which they have been disposed in the furnaces. In many instances they have been constructed of a cylindrical shape varying in length and diameter. Those first employed were of iron, with the axis vertical, but experience soon showed that this position was extremely inconvenient, on account of the difficulty which it occasioned in removing the coke.

The retorts were therefore next placed in a horizontal position, as being not only more favorable to the

most economical distribution of the heat, but better adapted to the introduction of the coal and the subsequent removal of the coke. At first the heat was applied directly to the lower part of the retort; but it was soon observed that the high temperature to which it was necessary to expose it, for the perfect decomposition of the coal, proved destructive to the lower side, and rendered it useless long before the upper part had sustained much injury. The next improvement was, accordingly, to interpose an arch of brickwork between it and the furnace, and to compensate for the diminished intensity of the heat, by a more equally diffused distribution of it over the surface of the retort. This was effected by causing the flue of the furnace to return toward the mouth of the retort, and again conducting it in an opposite direction, till the heated air finally escaped into the chimney. This arrangement was continued so long as iron retorts were in use, but on the general adoption of clay retorts the furnaces were constructed to allow the fire to play freely around them.

The Hydraulic Main.—From the retorts, the gas after its production ascends by means of pipes called ascension-pipes into what is termed the condensing or hydraulic main, which is a large pipe or long reservoir placed in a horizontal position, and supported by columns in front of the brickwork which contains the retorts. This part of a gas apparatus is intended to serve a twofold purpose; first, to condense the tar and some ammoniacal liquor, and second, to allow each of the retorts to be charged singly without permitting the gas produced from the others, at the time that operation is going on, to make its escape. To accomplish these objects one end of the hydraulic main is closed by a flange; and the other, where it is connected with the pipes for conducting the gas toward the tar vessel and purifying apparatus, has, crossing it in the inside, a partition occupying the lower half of the area of the section, by which the condensing vessel is always kept half full of liquid matter. The stand-pipes are connected by a flange with a dip-pipe arising from the upper part of the condensing main, and as the lower end of it dips about two inches below the level of the liquid matter, it is evident that no gas can return and escape when the mouth-piece on the retort is removed, until it has forced the liquid matter over the bend, a result which is easily prevented by making it of a suitable length. The tar which is deposited in the hydraulic main overflows at the partition, and is carried by a pipe to the tar well.

Condensation.—The gas as it passes on from the hydraulic main is still of a temperature from 130° to 140° Fahr., and consequently carries with it heavy hydrocarbons, which, as its temperature falls, would be deposited. It is therefore a first consideration in ordinary working to have these condensable vapors at once separated, and the object of the condenser is to cool the gas down to a temperature nearly that of the surrounding atmosphere. The first contrivances employed for the purpose of condensation were all constructed on the supposition that the object would be best attained by causing the gas to travel through a great extent of pipe surrounded by cold water, and winding through it like steam in the worm of a still, or ascending and descending in a circuitous manner. An improvement on this form of condenser is now in general use. It consists of a series of upright pipes connected in pairs at the top by semicircular pipes, and terminating at the bottom in a trough containing water, and divided by means of partitions in such a way that, as the gas enters the trough from one pipe, it passes up the next pipe and down into the next partition, and so on to the end of the condenser. The cooling power of this air condenser, as it is called, is sometimes assisted by allowing cold water to trickle

over the outer surface of the pipes. Annular tubes for condensing are also used, in which the gas is exposed to a much greater cooling surface, and in some large works the condensers are cooled by a current of water. In passing through the pipes the gas is considerably reduced in temperature, and the tar and ammoniacal liquor condense, the tar subsiding to the bottom of the troughs, and the ammoniacal liquor floating on the surface. In course of time the water in the trough is entirely displaced by these two gaseous products, and as they accumulate they pass off into the tar-tank, from which either liquor can be removed by means of a pump adapted to the purpose.

Exhaustion.—To the subsequent progress of the gas considerable obstructions are interposed in connection with its further purification and storing in the gas-holders, and the result of which would be that, were it not artificially propelled, there would be a pressure in the retort equal to the amount of the resistance the gas meets with in its onward progress. The relief of this back pressure not only improves the quality of the gas, but also increases its amount by about ten per cent.

The Purifiers.—The ordinary lime purifier, by which sulphureted hydrogen and carbonic acid are abstracted from the gas, consists of a large rectangular vessel. Internally it is occupied with ranges of wooden trays or sieves, made in the form of grids of one-half inch wood, with about half an inch between the bars. These are covered with slightly moistened slaked lime to the depth of about six inches, and from three to six such sieves are ranged in each purifier. The gas enters at the bottom by a tube, the mouth or inlet being protected from lime falling into it by a cover, and it forces its way upward through all the trays, till reaching the lid or cover, it descends by an internal pocket to the exit tube, which leads to the next purifier. The edges of the lid dip into an external water seal or lute whereby the gas is prevented from escaping. The purifiers are generally arranged in sets of four, three being in use, through which the gas passes in succession while the fourth is being renewed.

For the separation of the carbonic acid, which is unaffected by this treatment, the gas next passes on to a dry lime purifier. The gas is now ready for use, and it is passed on through the station meter to register the amount made and stored in the gas-holders.

The Gas-holder.—This, which is frequently designated the gasometer, though incorrectly, since it does not in any way measure gas, but simply stores it for consumption, consists of two portions—the “tank” and the “holder.” The tank is a cylindrical pit, surrounding a central core, which is usually covered with concrete at top, and has its sides built of masonry or brickwork. The tank is water-tight, and is filled to a high level with water, above which project two tubes, one being the inlet and the other the supply pipe, which leads to the main governor.

Formerly gas-holders were made of heavy plate iron, strengthened by angle-iron and stays, and of so great a weight as to require a complex system of equilibrium chains and counterbalancing weights to relieve the gas from the great pressure to which it would otherwise be subjected. They are now made so light that they require to be loaded in order to supply the required pressure, and their rise and fall are regulated by means of guide-rods around the tank. For economy of space, holders, in which different segments “telescope” over each other, are now much employed.

The Governor.—An efficient control of the pressure of the gas, along its whole course, from the gas-holder to the point of consumption, is an object of great importance for the avoiding of leakage, for equal distribu-

tion, and for supplying the burners at that pressure which yields the largest illuminating effect. Uncontrolled pressure may supply certain levels in a proper manner, but will leave low-lying districts insufficiently supplied, while the pressure in high districts will be excessive. The variations from simple difference of level may be very great. The varying consumption from dusk onward also greatly affects unregulated pressure. To control and correct these and other irregularities and disturbances, governors are now used—at the works or station for delivering the gas to the mains, in districts to correct variations owing to level, and beyond the consumers’ meters for controlling house supply; while in certain forms of burners a regulating apparatus is also inserted. The principle on which all governors are based consists in causing the gas by its own pressure to act on some form of sensitive surface which opens or closes a valve or aperture in proportion to the variations of pressure exerted on it.

GAS FROM SOURCES OTHER THAN COAL.

Petroleum-Gas.—Petroleum being a substance obtained in great abundance, notably in America, is used, not only directly as an illuminating agent, but also for production of gas; and as an enricher of common coal-gas it is applied at several works in New York and Brooklyn. Its preparation is effected by distilling it first at a low temperature into a rich vapor, which, when passed into highly heated retorts, is converted into permanent gas of an illuminating power about five times greater than common gas, and which is, moreover, absolutely free from ammonia, sulphur compounds and carbonic acid. On account of its great richness, petroleum-gas must be consumed in special burners of very fine aperture, at a rate varying from five to two feet per hour.

Oil-Gas.—In the early stages of gas manufacture many attempts were made to substitute gas distilled from inferior oils for coal-gas. The oil was distilled by allowing it to percolate into highly heated retorts, in which a quantity of coke or a like porous solid was placed, and the distillate was a richly luminiferous gas free from hurtful impurities. Although oil in this form yields a convenient and powerful illuminant, its direct combustion is much more economical; and as all oils and fats are highly valuable for many purposes besides illumination, they cannot compete with gas-coal as a source of gas. Nevertheless the New York Gas Light Company manufactured oil-gas exclusively from 1824 till 1828, and sold their product at \$10 per 1000 feet. The distillation of suint from wool-washing, and of recovered spent soap, are examples of the application of oleaginous substances for gas-making.

Resin-Gas.—In its treatment and results resin, as a source of gas, is very similar to oil. It yields a pure gas of great illuminating power, and for twenty years (1828–48) it was supplied in New York at \$7 per 1000 feet. Previous to the civil war of 1861–65 it was a good deal used on the European continent.

Wood-Gas.—The original experiments of Lebon, it will be remembered, were made with wood-gas, but he failed to obtain from his product an illuminating power that would compare with that of coal-gas. Lebon’s failure was in later years shown to arise from distilling at a temperature which gave off chiefly carbonic acid with non-luminous carbonic oxide and light carbureted hydrogen, leaving in the retort a tar which the application of a higher heat would have resolved into highly luminiferous gases and vapors. Pettenkofer, who pointed out the fact, devised a system of wood-gas making in which the products of the low-heat distillation were volatilized by passing through a range of red-hot

pipes; but now it is found that ordinary retorts, properly heated and fed with small charges, answer perfectly well for the operation. Wood-gas, owing to its high specific gravity and the proportion of carbonic oxide it contains, must be burned at considerable pressure, in specially constructed burners with a large orifice. It is largely used in Germany, Switzerland, and Russia, where wood is more easily obtained than coal. It was used at Philadelphia gas-works in 1856, where it was affirmed to be cheaper and of greater luminosity than coal-gas.

Peat-Gas is evolved under circumstances the same as occur in connection with the wood-gas manufacture, but the amount of moisture contained in peat is a serious obstacle to its successful use in this as in most other directions. Earnest and persistent efforts have been made to use peat as a source of gas, but these have met but little commercial success. To a limited extent it is used in various German factories which happen to be situated in the neighborhood of extensive peat deposits. For Natural Gas in the U. S., see Supplement, p. 2140.

Carbureted Gas.—Under this head may be embraced all the methods for impregnating gaseous bodies with vapors of fluid or solid hydrocarbons. The objects aimed at in the carbureting processes are—(1) to increase the illuminating power of ordinary coal-gas; (2) to render non-luminous combustible gases, such as water-gas, luminiferous; and (3) so to load non-combustible gases with hydrocarbon vapor as to make the combination at once luminiferous and a supporter of combustion. The plan used in the United States for the making of water-gas is either the Lowe or Mothay system or a modification of both. The method used in New York and Chicago is the decomposition of superheated steam into hydrogen, and then adding petroleum vapor as a means of increasing its illuminating power. This is done by introducing into a cupola filled with white-hot anthracite coal a volume of superheated steam and then throwing on the surface of the coal crude petroleum or naphtha. The resultant vapor is then passed into another cupola filled with heated fire-bricks. The subsequent processes are the same as in coal gas manufacture. About 300 gallons of oil and 3,500 pounds of anthracite coal will make 75,000 feet of gas—much cheaper than coal gas.

GASCOIGNE, GEORGE, one of the great pioneers of Elizabethan poetry, was born about 1535—as is believed, in Westmoreland. He was the son and heir of Sir John Gascoigne. He studied at Cambridge, and was admitted to Gray's Inn in 1555. His youth was unsteady, and his father disinherited him. In 1565 he had written his tragedy of *The Glass of Government*, not printed until 1576. In 1566 his first published verses were prefixed to a book called *The French Littleton*, and he brought out on the stage of Gray's Inn two very remarkable dramas, *Supposes*, the earliest existing English play in prose, and *Jocasta*, the first attempt to naturalize the Greek tragedy. Of the latter only the second, third and fourth acts were from his hand. Soon after this he married. In 1572 there was published *A Hundred sundry Flowers bound up in one small Posy*, a pirated collection of Gascoigne's lyrics, he having started in March of that year to serve as a volunteer under the Prince of Orange. He was wrecked on the coast of Holland and nearly lost his life, but obtained a captain's commission, and acquired considerable military reputation. An intrigue, however, with a lady in the Hague, nearly cost him his life. He regained his position, and fought well at the siege of Middleburg, but was captured under the walls of Leyden, and sent back to England after an imprisonment of four months. In 1575 he issued an authoritative edition of his poems under the name of *Posies*. In the summer of

the same year he devised a poetical entertainment for Queen Elizabeth, then visiting Kenilworth; this series of masques was printed in 1576 as *The Princely Pleasures*. Late on in 1575 he greeted the queen at Woodstock with his *Tale of Hemetes*, and presented her on next New Year's day with the MS. of the same poem, which is now in the British Museum. He completed in 1576 his two most important works, *The Complaint of Philomene*, and *The Steel Glass*, the first of which had occupied him since 1562; they were printed in a single volume. Later on in the same year he published *A Delicate Diet for Dainty-mouthed Drunkards*. He fell into a decline and died at Stamford on October 7, 1577.

GASCOIGNE, SIR WILLIAM, was chief-justice of England in the reign of Henry IV. Both history and tradition testify to the fact that he was one of the great lawyers who in times of doubt and danger have asserted the principle that the head of the state is subject to law, and that the traditional practice of public officers, or the expressed voice of the nation in parliament, and not the will of the monarch or any part of the legislature, must guide the tribunals of the country. The judge was a descendant of an ancient Yorkshire family. The date of his birth is uncertain, but it appears from the Year Books that he practiced as an advocate in the reigns of Edward III. and Richard II. On the banishment of Henry of Lancaster, Gascoigne was appointed one of his attorneys, and soon after Henry's accession to the throne was made chief-justice of the Court of King's Bench. After the suppression of the rising in the north in 1405, Henry eagerly pressed the judge to pronounce sentence upon Scrope, the archbishop of York, and the earl marshal Thomas Mowbray, who had been implicated in the revolt. The judge absolutely refused to do so, asserting the right of the prisoners to be tried by their peers. Although both were afterward executed, the chief-justice had no part in the transaction. The often told tale of his committing the Prince of Wales to prison has of course been doubted by modern critics, but it is both picturesque and characteristic. The judge had directed the punishment of one of the prince's riotous companions, and the prince who was present and enraged at the sentence struck or grossly insulted the judge. Gascoigne immediately committed him to prison, using firm and forcible language, which brought him to a more reasonable mood, and secured his voluntary obedience to the sentence. The king is said to have approved of the act, but there appears to be good ground for the supposition that Gascoigne was removed from his post or resigned soon after the accession of Henry V. He died in 1419, and was buried in the parish church of Harewood in Yorkshire.

GASCONY, an old province in the southwest of France, nearly identical with the *Novempopulania* or *Aquitania Tertia* of the Romans. Its original boundaries cannot be stated with perfect accuracy, but it included what are now the departments of Landes, Gers, and Hautes-Pyrénées, and parts of those of Haute-Garonne and Ariège. Its capital was Auch. (See AQUITANIA and GUIENNE.)

GASKELL, ELIZABETH CLEGHORN, one of the most distinguished of England's women-novelists, was born at Cheyne Row, Chelsea, September 29, 1810. During Elizabeth's childhood at Knutsford she was visited now and then by her sailor-brother; but while she was still a girl he went to India, where he somewhat mysteriously, and without any apparent motive, disappeared, and all further trace of him was lost. She was afterward sent for about two years to a school kept by a Miss Byerley, at Stratford-on-Avon, and on leaving school went for a

time to live with her father. Under his guidance she continued her studies, reading with him in history and literature, and working, chiefly by herself, at Latin, Italian, and French, in all of which she was, in later life, proficient. Having tenderly nursed her father in his last illness, she returned to her aunt at his death, in 1829; and, with the exception of one or two visits to Newcastle, London, and Edinburgh, she continued to live at Knutsford till her marriage. She had at this time a reputation for great beauty; and, even in later life, her exquisitely-shaped, soft eyes retained their light, and her smile its wonderful sweetness. Her marriage to the Rev. William Gaskell, M.A., of Cross Street Chapel, Manchester, took place August 30, 1832, at Knutsford church; and during the earlier years of her married life Mrs. Gaskell lived very quietly in Manchester, surrounded by a few intimate and cultured friends, and devoting all her time and abilities to the cares of a necessarily frugal household. She began by writing a short paper called *An Account of Clopton Hall*, for William Howitt's *Visits to Remarkable Places*. This was followed by one or two short stories, such as the *Sexton's Hero*, for the *People's Journal*; and then she wrote *Mary Barton, a Tale of Manchester Life*. On its completion, she sent it to one publisher in London, who rejected it unread, and then to Messrs. Chapman and Hall, who, after keeping the manuscript for a year without acknowledgment, wrote to her accepting the novel for publication, and offering the authoress £100 for the copyright. The appearance of *Mary Barton*, in 1848, caused great excitement in Manchester, and a strong partisanship was felt for and against its anonymous author. After its publication Mrs. Gaskell paid several visits in London, where she made many friends, among whom we may mention Dickens, Forster, Mrs. Jameson, Lord Houghton, Mrs. Stow, Ruskin, and Florence Nightingale. But *Mary Barton* was to prove only the first of a series of scarcely less popular publications, which appeared either independently or in periodicals such as *Household Words*. It was followed, in 1850, by *The Moorland Cottage*. *Cranford* and *Ruth* appeared in 1853; *North and South*, in 1855; *The Life of Charlotte Brontë*, in 1857; *Round the Sofa*, in 1859; *Right at Last*, in 1860; *Sylvia's Lovers*, in 1863; and *Cousin Phillis and Wives and Daughters*, in 1865.

She died suddenly of heart disease, about 5 o'clock on Sunday evening, November 12, 1865.

GASSENDI, PIERRE, one of the most eminent French philosophers was born of poor but respectable parentage at Champcerrier, near Digne, in Provence, on January 22, 1592. In 1612 he was called to the college of Digne to lecture on theology. Four years later he received the degree of doctor of theology at Avignon, and in 1617 he took orders as a priest. In the same year he was called to the chair of philosophy at Aix, and seems gradually to have withdrawn from the theological study and teaching. He died at Paris, on October 24, 1655, in the sixty-third year of his age.

GASTEIN, a beautiful and picturesque valley in the Austrian duchy of Salzburg, celebrated for its mineral springs. It is a side valley of the upper Salzach valley, and is about twenty-five miles long and one and one-quarter miles broad. It has an elevation of between 3,000 and 3,500 feet. Behind it, to the south, tower the mountains Malnitz or Nassfeld-Tauern, 7,820 feet high, and the Ankogel, 10,700 feet high, and from the right and left of these mountains two smaller ranges run northward, forming its two side walls. The river Ache traverses the valley, and near Wildbad-Gastein forms two magnificent waterfalls, the upper, the Kesselfall, 200 feet, and the lower, the Bärenfall, 280 feet in height;

and near these falls another called the Schleierfall, 250 feet high, is formed by the stream which drains the Pockhart-See. The principal villages are Böckstein, Hof-Gastein and Wildbad-Gastein, and the population of the whole valley is about 3,800.

GASTEROPODA, or GASTROPODS, a class of mollusks, inferior in organization to cephalopods, but far superior to almost all other mollusks, and containing a multitude of species, the greater number of which are marine, though some are inhabitants of fresh water, and some are terrestrial. Snails, whelks, periwinkles, limpets, cowries, and the greater number of mollusks with univalve shells belong to this class, and univalve mollusks constitute the greater part of it; but it contains also some mollusks with multivalve shells, as chitons, and some, as slugs, which have either only a rudimentary internal shell, or no shell at all. Some aquatic kinds are destitute of shell in the adult state, but they are protected by a rudimentary shell on first issuing from the egg.

GASTROCHÆNA, a genus of lamellibranchiate mollusks, having a delicate shell of two equal valves, gaping in front; the animal sometimes taking possession of an already existing cavity, which it often lines with a calcareous lining, so as to form a tube, to which the valves of its shell are cemented; sometimes burrowing for itself in sand, madrepores, or calcareous rocks, and lining its hole with a shelly layer. *G. modiolina*, a mollusk common in the Mediterranean and other waters, perforates shells and limestone, making holes about two inches deep and half an inch in diameter. It sometimes bores right through an oyster into the ground below, and makes for itself a flask-shaped case, with its neck fixed in the oyster-shell.

GASTROCNEMIUS MUSCLE, THE, is the muscle forming the greater part of the calf of the leg. It arises by two heads from the two condyles of the thigh bone, and is inserted by the tendo achillis at the posterior part of the heel-bone. In man, these muscles possess great power, and are constantly called in use in standing, walking, leaping, etc.

GASTRODIA, a genus of orchids. *G. sesamoides* is a native of Van Dieman's Land, the roots of which form large coral-like masses, and are sometimes called *native potatoes*, being edible; but they are watery and insipid.

GASTROSTOMY (Gr. *gaster*, the belly or stomach, and *stoma*, mouth), an operation which has been performed for the relief of stricture of the gullet, to relieve the patient from danger of starvation, by introducing food directly into the stomach through an external opening.

GASTROTOMY (Gr. *gaster*, and *tomein*, to cut), an incision into the cavity of the abdomen for the purpose of removing some diseased texture or foreign body. The term has also been applied to Cesarean section.

GATAKER, THOMAS, a learned English divine, was born in London in 1574, and educated at St. John's College, Cambridge. From 1601 to 1611 he held the appointment of preacher to the society of Lincoln's Inn, which he resigned on obtaining the rectory of Rotherhithe. In 1642 he was chosen a member of the Assembly of Divines at Westminster. The parts of the Assembly's annotations on the Bible which were executed by him are those on Isaiah, Jeremiah and the Lamentations. At Westminster he disapproved of the introduction of the Covenant, and declared himself in favor of Episcopacy. He was also one of the forty-seven London clergymen who disapproved of the trial of Charles I. He died in 1654.

GATCHINA, a town of Russia, in the government of St. Petersburg and district of Tsarskoselo, twenty-

nine miles west of St. Petersburg. It is situated in a flat, well-wooded and partly marshy district, and on the south side of the town are two lakes, distinguished as the White and Black.

GATES, HORATIO, an American general, was born at Maldon in Essex, England, in 1728. He entered the English army at an early age, and soon obtained considerable promotion. He was severely wounded while accompanying General Braddock in his unfortunate expedition against the French settlements on the Ohio in 1755, and he took part in the expedition against Martinico in January, 1762. After the peace of 1763 he purchased an estate in Virginia, where he resided till the commencement of the revolutionary war in 1775, when he was named by congress adjutant-general. In 1776 he was appointed to command the army on Lake Champlain; but, his conduct there not having been approved of, he was superseded in the following spring; yet in August he was sent to oppose General Burgoyne, whom he totally defeated on the 16th of October, and compelled to surrender his whole army,—an achievement which was, however, largely due to the previous maneuvers of Schuyler, whom Gates superseded. After obtaining the chief command in the southern districts, Gates was totally defeated at Camden, in South Carolina, by Lord Cornwallis, on August 16, 1780. On this account he was superseded by General Greene; but an investigation into his conduct terminated in acquitting him fully and honorably of all blame, on the ground that his defeat had been unavoidable in the disorganized state of the army under his command. After this he again retired to his Virginia estate, whence he removed to New York in 1800. On his arrival he was immediately admitted to the freedom of the city, and then elected a member of the State legislature. Before his departure from Virginia he granted emancipation to his slaves, accompanying their manumission with a provision for those who needed assistance. He died April 10, 1806.

GATESHEAD, a municipal and parliamentary borough and market-town of England, county of Durham, is situated on the right bank of the Tyne, opposite Newcastle, of which it practically forms a part, being united with it by three bridges. Pop. (1901), 109,887.

GATH, one of the five chief cities of the Philistines. Its site appears to have been known in the fourth century, but the name is now lost.

GATTY, MRS. ALFRED, daughter of the Rev. Dr. Scott, chaplain to Lord Nelson, was born at Burnham, Essex, in 1809. In 1839 Margaret Scott was married to the Rev. Alfred Gatty, D.D., vicar of Ecclesfield near Sheffield, sub-dean of York cathedral, and the author of various works both secular and religious. In 1842 she published in association with her husband a life of her father, the Rev. Dr. Scott; but her first independent work was *The Fairy Godmother and other Tales*, which appeared in 1851. This was followed in 1855 by the first of five volumes of *Parables from Nature*, the last being published in 1871. She died October 3, 1873.

GAUDEN, JOHN, the reputed author of the *Eikon Basilike*, was born in 1605 at Mayfield in Essex, of which parish his father was vicar. Between 1642, the date of his first printed work, and 1660 he published some thirteen or more books, of which number, however, only one appeared prior to the execution of the king. Soon after his appointment to the see of Exeter, he privately laid claim to the authorship of the *Eikon Basilike*, a work commonly attributed at the time to Charles I. This claim Gauden put forth in a correspondence with the Lord Chancellor Hyde, earl of Clarendon, and the earl of Bristol, from December 21,

1660, to March 31, 1662. The letters of Gauden among them have been published in Doctor Maty's *Review* in 1782, and again in the Appendix to vol. iii. of the *Clarendon Papers*. In 1662, on the death of Brian Duppa, bishop of Winchester, Doctor Gauden applied to be translated from Exeter to that see, but his claims were set aside in favor of George Morley, bishop of Worcester, and the vacancy thus created was filled by the bishop of Exeter. He only lived four months after this last promotion, and dying on September 20, 1662, was buried in Worcester Cathedral. His will is preserved in the Prerogative Office of Canterbury.

GAUDICHAUD-BEAUPRÉ, CHARLES, a French botanist, was born at Angoulême, September 4, 1789. He studied pharmacy first in the shop of a brother-in-law at Cognac, and then under Professor Robiquet at Paris, where, from Desfontaines and L. C. Richard, he acquired a knowledge of botany. In April, 1810, he was appointed dispenser in the military marine, and from July 1811 to the end of 1814 he served at Antwerp. In September 1817 he joined the corvette *Uranie*, as pharmaceutical botanist to the circumnavigational expedition commanded by De Freycinet. The wreck of the vessel on the Falkland Isles, at the close of the year 1819, deprived him of more than half the botanical collections he had made in various parts of the world. In 1830-33 he visited Chili, Peru, and Brazil, and in 1836-37 he acted as botanist to *La Bonite* during its circumnavigation of the globe. His theory accounting for the growth of plants by the supposed coalescence of the elementary "phytons" involved him, during the latter years of his life, in much controversy with his fellow-botanists, more especially M. de Mirbel. He died January 16, 1854.

GAUERMANN, FRIEDRICH, an Austrian painter, son of the landscape painter Jacob Gauermaun (1773-1843), was born at Wiesenbach near Gutenstein, in Lower Austria, September 20, 1807. Two animal pieces which he exhibited at the Vienna Exhibition of 1824 were regarded as remarkable productions for his years, and led to his receiving commissions in 1825 and 1826 from Prince Metternich and Caraman, the French ambassador. His reputation was greatly increased by his picture *The Storm*, exhibited in 1829, and from that time his works were much sought after, and obtained correspondingly high prices. His *Field Laborer* was regarded by many as the most noteworthy picture in the Vienna exhibition of 1834, and his numerous animal pieces have entitled him to a place in the first rank of painters of that class of subjects. The peculiarity of his pictures is the representation of human and animal figures in connection with appropriate landscapes and in characteristic situations, so as to manifest nature as a living whole, and he particularly excels in depicting the free life of animals in wild mountain scenery. Along with great mastery of the technicalities of his art, his works exhibit patient and keen observation, free and correct handling of details, and bold and clear coloring. He died at Vienna, July 7, 1862.

GAUGE, in the mechanical arts, is the name applied to a great variety of instruments, of which the object may be broadly stated to be the affording of increased facilities for comparing any two dimensions or distances. Wherever it is necessary for this to be done with a degree of accuracy unattainable by such means as the ordinary measuring rule affords, or for the same dimensions to be frequently measured with a maximum of speed and certainty, there will the hand-craftsman at once avail himself of some form of gauge. At the present day a due appreciation of the value of gauges is of growing importance to the mechanic, since they enable him greatly to improve the "fit" of the several portions of

his machinery, while at the same time the labor expended in fitting is materially reduced. Indeed, the system of making all similar parts "to gauge," so that in any number of machines they are interchangeable, is now effecting more than any other single cause for the improvement and cheapening of mechanical substitutes for manual labor.

GAUHÁTI, a town in Kámrúp, district Assam, the chief town of the province, situated on the left or south bank of the Brahmaputra, which is the most populous town in the Brahmaputra valley, was the seat of the British administration of Assam up to 1874, when the headquarters were removed to Shillong in the Khási hills, sixty-seven miles distant, with which it is connected by an excellent cart road.

GAUL, the name given by the Romans to the country lying between the Rhine and the Pyrenees. When the Greeks first became acquainted with the southwest of Europe they applied to the whole of it, in a somewhat vague sense, the term Celtic, calling its inhabitants Celts. Later we find Galatia and Gallia, with the corresponding Galati and Galli, used as nearly synonymous with the earlier name. The shorter of these two forms the Romans adopted; and in the opening chapter of Caesar's well-known *Commentaries*, we have our first definite account of the limits of the country and its divisions, as then understood. According to this authority, Gaul was in his day divided among three peoples, more or less distinct from one another, the Aquitani, the Gauls, who called themselves Celts, and the Belgæ. The first of these extended from the Pyrenees to the Garumna (Garonne); the second from that river to the Sequana (Seine) and its tributary the Matrona (Marne), reaching eastward presumably as far as the Rhenus (Rhine); and the third from this bounding line to the mouth of the last-named river, thus bordering on the Germans. By implication Caesar recognizes a fourth division, the Provincia, lying to the south in the basin of the Rhodanus (Rhône), and stretching westward as far as Tolosa (Toulouse), in the basin of the Garonne—a portion of Gaul that had been subdued and made a Roman province about fifty years before Caesar entered on his career of conquest there. By far the greater part of the country was a plain watered by numerous rivers, the chief of which have already been mentioned, with the exception of its great central stream, the Liger or Ligeris (Loire). Its principal mountain ranges were Cebenna or Gebenna (Cevennes) in the south, and Jura, with its continuation Vosegus or Vogesus (Vosges), in the east. The tribes inhabiting Gaul in Caesar's time, and belonging to one or other of the three races distinguished by him, were numerous. Prominent among them, and dwelling in the division occupied by the Celts, were the Helvetii, the Sequani, and the Ædui, in the basins of the Rhodanus and its tributary the Arar (Saône), who, he says, were reckoned the three most powerful nations in all Gaul; the Arverni in the mountains of Cebenna; the Senones and Carnutes in the basin of the Liger; the Veneti and other Armorican tribes between the mouths of the Liger and Sequana. The Nervii, Bellovacii, Suessiones, Remi, Morini, Menapii, and Aduaticii were Belgic tribes; the Tarbelli and others were Aquitani; while the Allobroges inhabited the north of the Provincia, having been conquered in 121 B.C.

The ethnological relations of Caesar's three great Gallic races have given rise to much discussion. Greek writers, who, in consequence of the planting of the colony of Massilia (Marseilles) on its southern coast at so early a period as 600 B.C., had gained some knowledge of Gaul before the Romans, speak of its inhabitants as Ligurians; and it is certain that a people of this name occupied at one time the coast-line of Europe from the

western slopes of the maritime Alps to the Rhone. By many these Ligurians are regarded as having once spread themselves over a much wider area, peopling extensive tracts of Europe as well as Northern Africa. Subsequently, another race, coming probably across the Pyrenees from Spain, subdued southwestern Gaul, and ruled as far north as the Garonne—the Basques of the two slopes of these mountains, remaining to our own day their lineal representatives. Later still, but a date which history does not venture to fix, one of those great waves of population that are believed to have rolled in succession from east to west brought into northern and central Gaul, it may be at an interval of centuries, the two great branches of the Celtic race, the Gadhelic or Gaelic, and the Cymric—the one represented in Britain by the Irish and Scottish Highlanders, and the other by the Welsh. Reading Caesar's brief statements by the light thus afforded, ethnologists now generally hold that his Aquitani were Iberians, largely intermingled with intrusive Gauls; that his Gauls belonged to the Gaelic division of the Celtic race, and his Belgæ to the Cymric (both of them, however, being affected by the presence of races whose territory they had overrun, and the latter by the addition of a German element derived from their proximity to the Rhine); and that the natives of the Provincia were Ligurians, with so large an intermixture of Celts as to make the latter the dominant race. Neither the Greek colony of Massilia, nor those colonies sent out by it, can be supposed to have seriously affected the Gaulish nation from the point of view we are now discussing. It was in a different manner, as a civilizing agency, that they made their presence felt.

Such, it would appear, was Gaul ethnologically when made a part of the Roman empire by Julius Caesar shortly before the commencement of the Christian era; and, as has often been remarked, such in the main it is still. Some recent scientific inquirers find grounds, however, for concluding that the opinion, so prevalent not only in England but in France itself, that the physical and mental characteristics of the modern Frenchman are chiefly derived from the ancient Gauls, is only in part well founded. The Gauls, they say, like the Romans after them, were strong enough to impose their language on a race or races they had subjugated; but in the attempt to absorb them they themselves have suffered and continue to suffer so much that the day may yet come when the older race will all but regain its superiority. Slowly but surely, according to the researches of M. Roget, Baron de Belloguet, the blue-eyed, fair-haired, long-headed Celt has for many generations been giving place throughout France, in a direction proceeding from south to north, to a more ancient, dark-eyed, black-haired, round-headed man—a similar phenomenon being also noticeable among the Germans.

Northern Italy, in consequence of an intrusion of Gauls at some early date, received from the Romans the name of Gallia Cisalpina or Citerior, to distinguish it from Gaul proper, called also Gallia Transalpina or Ulterior. Afterward when the Roman element gained the upper hand, Togata was sometimes substituted for Cisalpina; while in contradistinction, Gallia Braccata was applied to the Provincia from the *bracæ* or trousers worn by the natives, and Gallia Comata to the rest of the country, from the inhabitants wearing their hair long. The Gaulish emigrations into Spain on the one hand, and into Britain on the other, scarcely come under the present article; still less can we refer here to the inroads of that restless race into various parts of eastern Europe and western Asia. But it may be remarked in passing that so extensive were the conquests of the Gauls that, in the beginning of the third century before our era, their empire, if much less compact, was

scarcely less extensive than that of Rome in her palmiest days.

For some time after the death of Cæsar little attention could be paid to Gaul by the ruling powers of Rome; but in 27 B.C. Augustus, now master of the Roman world, took measures to Romanize it thoroughly. The old division into four provinces was retained, and made subservient to administrative purposes. The Provincia, however, received the name of Gallia Narbonnensis, from the Roman town of Narbo (Narbonne); the boundaries of Aquitania were extended to the Liger; what remained of Cæsar's Gauls were constituted the province of Gallia Lugdunensis, so named from its capital the new settlement of Lugdunum (Lyons); and the northern division was called Gallia Belgica. This arrangement remained nearly unchanged till the fourth century, when the four provinces were broken up into seventeen, each with a capital and a number of other towns of more or less importance, the names of which may be found in the large geographical and historical works that treat of the period. While an integral part of the Roman empire Gaul often played no mean part in the contests that took place for the imperial purple; and it was during one of these that Claudius Civilis, a Romanized Gaul, made a gallant attempt to achieve the independence of his country. His efforts, however, were not supported by the mass of the people, and the movement was crushed by Vespasian. Perhaps the most noteworthy event of those centuries was the insurrection of the Bagaude or peasant banditti, in the reign of Diocletian. Ruined and driven to despair by the exactions of the imperial treasury, men scoured the country in marauding bands, plundering wholesale. Though the revolt was suppressed, the lesson it ought to have taught Rome was unheeded, and thus the seeds of future troubles remained in the soil. In the declining days of the empire Gaul became a prey to the Visigoths in the south, the Burgundians in the east, and the Franks in the northeast. Order being restored, the country took a more prominent place in the political system of Europe.

GAULT, a member of the cretaceous formation, separating the lower from the upper green-sand. It consists of an upper part, hard and sandy, has green particles scattered through it; and of a lower portion, a stiff dark gray, blue or brown clay, smooth and uniform in texture and very plastic, which is manufactured into tiles, bricks, and even common pottery.

GAUNT, JOHN OF. See LANCASTER, DUKE OF.

GAUR, or, more commonly, GOUR, the name of a mediæval city in Bengal, of which the scattered relics cover a large area in the district of Malda, commencing not far south of the modern civil station of that name.

GAUSS, CARL FRIEDRICH, an eminent German mathematician, was born of humble parents at Brunswick, April 23, 1777, and was indebted for a liberal education to the notice which his talents procured him from the reigning duke. His name became widely known by the publication, in his twenty-fifth year (1801), of the *Disquisitiones Arithmeticae*. In 1809 he published at Hamburg his *Theoria Motus Corporum Cælestium*, a work which gave a powerful impulse to the true methods of observation. With Weber's assistance he erected in 1833 at Göttingen a magnetic observatory free from iron, where he made magnetic observations, and from this same observatory he sent telegraphic signals to the neighboring town, thus showing the practicability of an electromagnetic telegraph. He further instituted an association, composed at first almost entirely of Germans, whose continuous observations on fixed term-days extended from Holland to Sicily. The volumes of their publication, *Resultate aus der Beobachtungen de Magnetischen Vereins*, extend from 1836 to 1839; and in

those for 1838 and 1839 are contained the two important memoirs by Gauss, *Allgemeine Theorie der Erdmagnetismus*, and the *Allgemeine Lehrsätze*—on the theory of forces attracting according to the inverse square of the distance. The instruments and methods thus due to him are substantially those employed in the magnetic observatories throughout the world. He died at Göttingen early in the spring of 1855. The centenary of his birth was celebrated (1877) at his native place, Brunswick.

GAUSSEN, FRANÇOIS SAMUEL ROBERT LOUIS, a Protestant theological writer of some repute, was born at Geneva on August 25, 1790, and died in 1863.

GAUTIER, THÉOPHILE, was born at Tarbes in the year 1811. He was educated at the grammar school of that town, and afterward at the Collège Charlemagne in Paris, where it does not appear that he particularly distinguished himself, though in later life his remarkable literary faculty and instinct enabled him to give to much of his work an air of scholarship and almost of erudition. He very early devoted himself to the study of the older French literature, especially that of the sixteenth and the early part of the seventeenth century. This study qualified him well to take part in the romantic movement, and enabled him to astonish Sainte-Beuve by the phraseology and style of some literary essays which, when barely eighteen years old, he put into the great critic's hands. He began (like Thackeray, to whom he presents in other ways some striking points of resemblance) as an artist, but soon found that his true powers lay in another direction. His first considerable poem, *Albertus* (1830), displayed a good deal of the extravagant character which accompanied rather than marked the movement, but also gave evidence of uncommon command of both language and imagery, and in particular of a descriptive power hardly to be excelled. The promise thus given was more than fulfilled in his subsequent poetry. But it was not, after all, as a poet that Gautier was to achieve either profit or fame. Thrown as he was into circles which were nothing if not literary, it was natural that he should attempt all literary forms, and certain, considering his powers, that he should be successful in all. For the theater, however, he had but little gift, and his dramatic efforts (if we can except certain masques or ballets in which his exuberant and graceful fancy came into play) are by far his weakest. For a time he acted as secretary to Balzac, but found this occupation uncongenial enough, though it left some traces in his independent work. His first novel of any size, and in many respects his most remarkable work, was *Mademoiselle de Maupin* (1835). During the years from 1833 onward, his fertility in novels and tales was very great.

It was, however, neither in poems nor in novels that the main occupation of Gautier as a literary man consisted. He was early drawn to the more lucrative task of feuilleton writing, and for more than thirty years he was among the most expert and successful practitioners of this art. He died in October, 1872.

GAUZE, a light, transparent, silken fabric, woven in an open manner with very fine yarn. It is said to have been originally made at Gaza in Palestine, whence the name. In the weaving of gauze the warp threads, in addition to being crossed as in plain weaving, are twisted in pairs from left to right and from right to left alternately, after each shot of weft, thereby keeping the weft threads at equal distances apart, and retaining them in their parallel position. The textures are woven either plain, striped, or figured; and the material receives many designations, according to its appearance and the purposes to which it is devoted.

GAVARNI, French caricaturist, was born at Paris in

1801, and died in 1866. His true name was Chevalier (Sulpice Guillaume), and he is said to have taken the *nom de plume* under which he is known from the place where he made his first published sketch. His name was exceedingly popular, and his illustrations for books were eagerly sought for by publishers. A single frontispiece or vignette was sometimes enough to secure the sale of a new book. Gavarni was much engaged, during the last period of his life, in scientific pursuits, and this fact must perhaps be connected with the great change which then took place in his manner as an artist. He sent several communications to the Académie des Sciences, and till his death, which happened on November 23, 1866, he was eagerly interested in the question of aerial navigation. It is said that he made experiments on a large scale with a view to find the means of directing balloons; but it seems that he was not so successful in this line as his fellow-artist, the caricaturist and photographer, Nadar.

GAVIAL. See CROCODILE.

GAY, JOHN, one of the most eminent of the secondary English poets, was a native of Devonshire, born in 1688 at Frithelstock, near Torrington, where his family had been long settled. His father dying when the future poet was only about six years of age, and leaving four children, the prospects of the family were unpromising; and John, after receiving his education at the grammar school of Barnstaple, was put apprentice to a silk mercer in London. He disliked the employment, obtained his discharge, and embarked in a literary life, varied only by incessant efforts to obtain the patronage of the great. Gay's ambition was limited to a life of ease, fine-dressing, and a luxurious table, in all of which he had marvelous success, but little contentment. In the years 1713 and 1714, besides the *Rural Sports*, he produced a comedy, *The Wife of Bath*, which was acted only three nights; *The Fan*, a poem; and *The Shepherd's Week*, a series of six pastorals drawn from English rustic life. In this fortunate year Gay was appointed secretary to the Earl of Clarendon, ambassador to the court of Hanover; but the death of Queen Anne, August 1, 1714, soon put an end to his hopes of permanent official employment. He then tried the drama, and produced his farce of *What d'ye Call it?* which was acted with little success in February 1714-15. In 1716 appeared his *Trivia, or the Art of Walking the Streets of London*, a poem in three books for which he acknowledged having received several hints from Swift. It is an excellent *town* poem, containing graphic and humorous descriptions of the London of that period. In January, 1716-17, the comedy of *Three Hours after Marriage* was brought on the stage, and emphatically condemned. In this piece Gay was assisted by Pope and Arbuthnot. Pope is distinctly visible in his allusions to Dennis the critic, and it is remarkable that three such men should have produced a play so dull, unnatural, and gross. Gay was taken to Aix by Mr. Pulteney in 1717. By the beginning of 1724 he had a new play ready, a tragedy called the *Capitimes*, which was patronized by the Princess (afterward Queen) Caroline and the Prince of Wales. In 1726 he published his famous *Fifty-one Fables in Verse*. His next work was the *Beggar's Opera*, performed in 1727, written in ridicule of the Italian Opera, which for a time it drove off the English stage. The poet died, after a short illness, December 4, 1732, and the duke and duchess of Queensbury honored his remains with a splendid funeral and monument in Westminster Abbey.

GAY, MARIE FRANÇOISE SOPHIE, MADAME, daughter of M. Nichault de Lavalette (who was attached to the household of Monsieur, afterward Louis XVIII.),

and of Francesca Peretti, a Florentine lady, was born at Paris July 1, 1776. Her first literary production was a letter written in 1802 to the *Journal de Paris*, in defense of Madame de Staël's novel *Delphine*; and in the same year she published anonymously her first novel *Laure d'Estell. Léonie de Montbrense*, which appeared in 1813, is considered by Sainte-Beuve her best work; but *Anatolie*, which appeared in 1815, has perhaps a higher reputation. These and several of her other works, amongst which may be specially named *Les Salons célèbres*, possesses an interest beyond their intrinsic merits—chief of which are purity and elegance of style—for their portrayures of French society especially during the period of the directory and the consulate, and of many of the distinguished personages whose intimacy she enjoyed. Madame Gay wrote several theatrical pieces which had considerable success. She was also an accomplished player on the pianoforte and harp, and composed both the words and music of a number of *romances*. She died in 1852.

GAYÁ, a district of British India in the Pantá division, under the lieutenant-governor of Bengal.

GAYÁ, the chief town and administrative headquarters of the above district, situated on the bank of the Phálgu river.

GAY-LUSSAC, JOSEPH LOUIS, one of the most distinguished of modern physicists and chemists, was born at St. Léonard, in the department of Haute Vienne, on December 6, 1778. Intended for the bar, young Gay-Lussac prosecuted his early studies in Latin and other elementary subjects at home, under the superintendence of the Abbé Bourdeix and other masters until 1794, when he was sent to Paris, where he worked very hard for three years preparing for admission to the École Polytechnique. After a brilliant examination he was received into this institution on December 27, 1797, whence on November 22, 1800 he was transferred to the school Des Ponts et Chaussées. Shortly afterward he was assigned to Berthollet, who had returned from Napoleon's Egyptian expedition, and who was desirous of having an able student from the École Polytechnique to aid him in his researches. The results expected by the author of the *Statique Chimique* were not verified by his assistant's experiments, which seem to have been recorded without any consideration of the theorizer's feelings. It was on this occasion, according to Arago, that Berthollet, at first nettled to find that his ideas were not confirmed, delivered himself as follows: "Young man, it is your destiny to make discoveries. You shall be henceforth my companion. I wish—it is a title of which I am sure I shall have cause some day to be proud—I wish to be your father in science."

Gay-Lussac accordingly entered on a long series of researches upon certain physical phenomena, which though of constant recurrence in experimental inquiries, had up this time been very imperfectly examined. In his first memoir he shows that different gases are dilated in the same proportion when heated from 0° to 80° (Réaumur). The investigations recorded in this memoir were followed by experiments on the improvements of thermometers and barometers, on the tension of vapors, their mixture with gases, and the determination of their density, evaporation, hygrometry, and capillarity. In course of these researches, which engaged him for a couple of years, he acquired not only dexterity in manipulation and the contrivance of experiments, but a great deal of valuable knowledge of physics. During the interval, in the year 1802, he had been nominated Fourcroy's demonstrator at the École Polytechnique, and as he had in this capacity to lecture frequently for the professor, he was beginning to acquire reputation as a teacher and expounder of chemistry and physics, by

the clearness, precision, and care which his lectures evinced. In 1803-4 certain results respecting terrestrial magnetism had been obtained during two balloon ascents, which appeared of such interest that the French Academy was desirous of having them repeated. Through Berthollet and Chaptal the balloon which had been used in Egypt was obtained, and fitted up with various instruments; the observations were intrusted to Gay-Lussac and Biot, who made their first ascent from the garden of the Conservatoire des Arts et Metiers, on August 24, 1804. In this ascent an altitude of 4,000 meters was attained, but unexpected difficulties were encountered, and the results were not decisive. Not satisfied with the expedition, Gay-Lussac got a larger balloon provided with every requisite, and made an ascent by himself on September 16th of the same year. On this occasion the balloon rose to a height of 7,016 meters, an altitude greater than any which had been formerly reached, and surpassed only by a few later ascents. At this great elevation of nearly 23,000 feet, and with the thermometer at $9\frac{1}{2}^{\circ}$ C. below freezing, Gay-Lussac remained for a considerable time making observations on temperature, on the moisture of the air, on magnetism, and other points. He observed particularly that he had considerable difficulty in breathing, that his pulse was quickened, and that by the absence of moisture in the air his mouth and throat became so parched that it was painful to swallow even a piece of bread. The experiments on magnetism for which the ascent was primarily made were imperfect, but they led him to the conclusion that the magnetic effect at all attainable elevations above the earth's surface remains constant. Having collected samples of air at different elevations he, on his return to Paris, proceeded to analyze them, and in conjunction with Alexander von Humboldt, whom he had associated with himself in this investigation, he published several papers on eudiometric analysis and related topics. The memoir, which was read to the Institute on October 1, 1804, contained the germ of what was afterward Gay-Lussac's most important generalization. The authors observed that when oxygen and hydrogen combine together by volume, it is in the proportion of one volume of the former to two volumes of the latter. Prior to this the numerous experiments on the volume composition of water had always brought out various complicated ratios, though approaching the simple one more or less closely. It was not, however, till 1808, that Gay-Lussac announced the law of combination by volume in its general form. Shortly after these investigations were completed, Gay-Lussac got leave of absence to accompany Von Humboldt on a scientific journey to Switzerland, Italy and Germany. Provided with physical and meteorological instruments, they left Paris March 12, 1805, and traveled by Lyons, Chambery and Mont Cenis to Genoa, and thence to Rome, where they arrived July 5th. After a short stay at Rome in the residence of William von Humboldt, during which Gay-Lussac made a few chemical analyses, they departed for Naples in company with Leopold von Buch, afterward so eminent as a geologist. During his visit Gay-Lussac had the opportunity of studying on the spot volcanic eruptions and earthquakes. Vesuvius, which was in violent action, he ascended six times. After this the party went back to Rome, and then started for Florence on September 17, 1805. A few days having been spent there, they went on to Bologna and thence to Milan, which they reached on October 1st, and there they had the pleasure of meeting Volta. The party crossed the St. Gothard on October 14-15, in the midst of a storm which prevented their seeing anything, and after some delay reached Göttingen, where they were received with much attention by Blu-

menbach, the famous naturalist. On November 16th they arrived in Berlin, where the winter and the following spring were spent. In this way Gay-Lussac became acquainted with the best society in Berlin, and was especially intimate with Klapproth and Erman. In spring he hurriedly returned to Paris. The death of an Academician had left a vacant place, and he was hopeful that he might be elected to fill it. Arago remarks that it is curious that Gay-Lussac should have found it necessary to be on the spot to insure success. What he had already done for science might have been considered sufficient, apart from personal considerations, but there were prejudices which might have acted unfavorably, if he had not been present to meet them. These were, however, successfully overcome, and he entered the Academy in 1806. In the following year was inaugurated the Société d'Arcueil, a small group of scientific men who used to assemble at Berthollet's house. Gay-Lussac was an original member of the society, which is of interest chiefly on account of its having been the means of publishing some papers which have since proved of great historical interest. The results of his magnetic observations made along with Humboldt were published in vol. i. of its *Mémoires* (1807); and vol. ii. (1809) contains the important memoir on gaseous combination, in which he pointed out that, when gases combine with one another by volume or by measure, they do so in the very simplest proportions, 1 to 1, 1 to 2, 2 to 3, and so on, and that the volume of the product in the gaseous state bears a very simple ratio to that of the constituents. This law, which, along with Humboldt, he had shown to be true of water, he extended to several other gases, and he even deduced from the vapor density of compounds that of certain elements, more particularly carbon, mercury and iodine, which had not been ascertained by direct experiment.

The next events in Gay-Lussac's scientific career are connected with what may be called his rivalry with Davy, who in matter of age (b. December 17, 1778) was almost exactly his contemporary. In 1808 when Davy, having isolated potassium and sodium, was awarded Napoleon's prize for the most important discovery in voltaic electricity, the emperor is said to have asked how it was that these discoveries were made abroad and French prizes were carried away. Having been informed that there was no battery of power equal to that used by Davy, he caused a very large one to be made, and presented to the École Polytechnique. While waiting for it, Gay-Lussac and Thénard succeeded in preparing potassium by a direct chemical action, in which fused potash was brought in contact with red-hot iron. This method enabled chemists to prepare the alkali metals in quantity, and Gay-Lussac and Thénard availed themselves of it to examine the properties of potassium very completely, and not only so, but also to use it as a means of decomposing other substances. It was in this way that they separated boron from boracic acid, an element which was also prepared by Davy with the same materials. It is worth notice that Davy admitted the advantage of the method of Gay-Lussac and Thénard, though he seems to have subsequently regarded their appropriation of the newly-discovered metal as not altogether warranted. The researches with the great battery after it was made did not come up to their expectations; the power fell far short of what had been anticipated, and they confined themselves rather to an examination of the phenomena presented by the apparatus itself, than to using it as an engine for effecting important decompositions.

In 1809 was published the second investigation parallel to one by Davy, namely, upon hydrochloric (or, as it was then called, muriatic) acid, and chlorine, then

called oxymuriatic acid. This memoir was read to the Institute, and was also published in the second volume of the *Mémoires d'Arceuil*.

Among the investigations which Gay-Lussac undertook with Thénard in the years 1810-1811, and which ultimately yielded most valuable results, must be mentioned those upon organic chemistry, and especially upon the analysis of fixed organic compounds. Before this time the only way of determining the composition of organic substances was to explode them with oxygen, and as this method was practicable only in the case of bodies which were gaseous, or could be readily volatilized, the great majority of fixed organic substances still remained unexamined. Gay-Lussac and Thénard introduced the plan of adding some oxidizing agent to the substance and burning it in a tube. They used chlorate of potassium, and the products of combustion were collected over mercury. The results obtained were in some cases very accurate, but the process was difficult of execution, and it is singular that the authors should have preferred it to the combustion with oxide of copper, which they also tried. In 1815, however, Gay-Lussac employed the latter agent for the examination of cyanogen, and the other method was abandoned. The final improvements were made some years later by Liebig, when working in Gay-Lussac's laboratory. By their original method Gay-Lussac and Thénard determined the composition of fifteen organic substances, including sugar, starch, gum, wax, oil, various woods, resin, mucic, oxalic, tartaric, citric and acetic acids; and albumen, fibrin, gelatin and casein. Gay-Lussac succeeded also, in 1811, in obtaining pure hydrocyanic acid. He described its physical properties, but did not announce anything about its composition till 1815, when he published his celebrated memoir in which he described cyanogen as a compound radical, prussic acid as a compound of this radical with hydrogen alone, and the prussiates as compounds of the radical with metals. He also showed how to prepare free cyanogen, and explained Berthollet's oxyprussic acid to be really chloride of cyanogen. The proof that prussic acid contains hydrogen and no oxygen was a most important support to the hydrogen acid theory, while the isolation of the radical cyanogen was of equal importance for the subsequent epoch of compound radicals in organic chemistry.

In 1813-14 Gay-Lussac published his memoirs on iodine. This was the third investigation which involved a rivalry with Davy, and it was also that about which there was most feeling. Courtois had discovered the substance in 1811, and had given some of it for examination to Clément-Désormes. He had only published a brief notice of it when Davy arrived in Paris, having obtained express permission of Napoleon to pass through France on his way to Italy. Davy got a few fragments of this curious substance, and after a brief examination with a very limited portable laboratory which he had with him, perceived its analogy to chlorine, and drew the conclusion that it must be a simple body of similar character. Gay-Lussac, it is said, having heard of Davy's making experiments with it, went off to Courtois, got a specimen, and proceeded to examine it. He also saw its likeness to chlorine, but his previous decision respecting that body hampered him, and it was with some hesitation that he ultimately acknowledged its elemental character. Whether or not Gay-Lussac was actuated by the motive ascribed to him by Arago—that it would be a reflection on French science were the settlement of the characters of this substance to be left to a foreigner visiting Paris—it is not necessary to inquire; but Davy seems to have felt that Gay-Lussac was competing, and not altogether fairly, with him. In

a letter to Clément he gives a brief account of his work, and lays claim to the first revelation of the elemental character of iodine, and again in a subsequent letter to his brother, which contains a short review of the Parisian chemists and their reception of him, the only complaint he makes is that Gay-Lussac had played him a trick in trying to appropriate the discovery of the character of iodine and of hydriodic acid. Quite apart, however, from this claim on Gay-Lussac's part, the memoirs remain models of investigation and description. Davy quite freely admitted that full light might be expected on the subject from its having been taken in hand by so able and accurate a chemist as Gay-Lussac.

The year 1815 saw the completion of the research on cyanogen already referred to, and with it concludes the period of Gay-Lussac's most important discoveries. Having now attained a leading if not the foremost place among the scientific men in the French capital, his advice was often required on important questions. His attention was thus turned in part from purely scientific subjects to points of practical interest. In these new fields, however, he displayed the same powers which he had exercised so sedulously in the pursuit of scientific truth; in fact he was now to introduce and establish scientific accuracy where there had been previously only practical approximations. The most important of these later discoveries were the method of estimating the amount of real alkali in potash and soda by the volume of standard acid required for neutralization; the method of estimating the amount of available chlorine in bleaching powder by a solution of arsenious acid; directions for the use of the centesimal alcoholometer, published in 1824, and specially commended by the commission of the Institute appointed to report on it, as displaying all the accuracy and exhaustive treatment of the author; and lastly, the perfecting of the method of assaying silver by a standard solution of common salt, a volume on which was published in 1833. This last has superseded the old method of assaying silver by cupellation, as being more rapid, more accurate, and easier of execution; and indeed all these processes are so complete and satisfactory, and are besides so identified with their author's name, that his reputation is secured by them, quite independently of his earlier work. In what has been said above, only the more important of Gay-Lussac's discoveries have been alluded to. To enter into an account, however brief, of all his labors, would occupy more space than can be allowed here. Indeed the list of his papers in the Royal Society's catalogue amounts to 148, besides those of which he was joint-author with Von Humboldt, Thénard, Welter, and Liebig; and they embrace every department of the science as cultivated fifty years ago. Among his later researches may be mentioned those on fermentation, and those executed by Liebig in conjunction with him, after the young German chemist had gained the coveted admission to Gay-Lussac's private laboratory during the years 1823-24. The latter include improvements on organic analysis, and the examination of fulminic acid. Gay-Lussac continued his work, and published the results in the *Annales de Chimie*, of which he had been joint-editor for some thirty years, up till almost his death, which took place at Paris on May 9, 1850.

GAZA, an ancient city of Philistia, close to the sea and to the south boundary of the Holy Land.

GAZA, THEODORUS, one of the leaders of the revival of learning in the fifteenth century, was born at Thessalonica about the year 1400. About 1440 he became professor of Greek in the newly founded university of Ferrara, to which students in great numbers from all parts of Italy were soon attracted by his fame as a teacher. From 1456 to 1458 he lived at Naples under

the patronage of Alphonso the Magnanimous; and shortly after the latter date he was appointed by Cardinal Bessarion to a benefice in the south of Italy, where the latter years of his life were spent, and where he died at an advanced age in 1478.

GAZELLE is a name given to some twenty different species of antelopes, which differ from each other principally in the form of curvature of the horns, in the female, and in the color. The true gazelle (*Gazella Dorcas*) is a species about the size of a roebuck, but of lighter and more graceful form, with longer and more slender limbs, in these respects exhibiting the typical characters of the antelopes in their highest perfection. It is of a light tawny color, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-color, with white and dark stripes. The horns of the old males are nine or ten inches long, bending outward and then inward, like the sides of a lyre, also backward at the base and forward at the tips, tapering to a point, surrounded by thirteen or fourteen permanent rings, the rings near the base being closest together and most perfect. The horns of the female are smaller and obscurely ringed. The ears are long, narrow, pointed; the eyes very large, soft, and black; there is a tuft of hair on each knee; the tail is short, with black hairs on its upper surface only, and at its tip. The gazelle is a native of the north of Africa, and of Syria, Arabia, and Persia. Great herds of gazelles frequent the northern borders of the Sahara; and notwithstanding their great speed, and the resistance which they are capable of making when compelled to stand at bay—the herd closing together with the females and young in the center, and the males presenting their horns all around—lions and panthers destroy them in great numbers.

GAZETTE, THE LONDON, is the official newspaper of the government, and is published every Tuesday and Friday. It contains proclamations, orders, regulations, and other acts of state, and is received as evidence thereof in legal proceedings. It also contains notices of proceedings in bankruptcy, dissolutions in partnerships, etc. The bankruptcy Act, 1869, requires the order of adjudication to be published in the *Gazette*, and makes the *Gazette* conclusive evidence of adjudication. Other statutes, dealing with other subjects, have similar provisions. Unless by virtue of such statutes, the *Gazette* is not evidence of anything but acts of state. The Scotch law of evidence would appear to be not so stringent. Gazettes are also published in Edinburgh and Dublin.

GEBANG PALM (*Corypha gebanga*), a fan-leaved palm, native of the East Indies, and one of the most useful palms of that part of the world. Its stem yields a kind of sago; its root is medicinal, being both emollient and slightly astringent, so as to be particularly adapted to many cases of diarrhoea; its leaves are used for thatch, for making hats, and for various economical purposes; its young leaves are plaited into baskets and bags, in the manufacture of which many of the people of Java find much employment; the fibers of its leaf-stalks are made into ropes, baskets, nets, cloth, etc. To the genus *Corypha* belongs also the talipot palm. The fruit of *C. pumas*, a Mexican species, is eatable.

GEBER. It seems to be pretty generally believed that the Geber of Western Europe is the same as the person who is called in full Abu Musa Dschabir (or Jabir) Ben Haijan Ben Abdallah el-Sufi el-Tarsusi el-Kufi, who was reckoned the most illustrious of the alchemists by the Arabs, and who is mentioned in the *Kibab al-Fihrist* (tenth century) by Ibn Khallikan (thirteenth century), by Haji Khalfa (seventeenth century) and other writers. If this be correct, Geber must

have flourished in the eighth century, for according to Haji Khalfa, Dschabir Ben Haijan died in the 160th year of the Hegira, which corresponds with the year beginning October 19, 776 A.D. His birthplace was Tarsus, or, as others say, Kufa; and he is said to have resided at Damascus and Kufa. Other writers have tried to show that Geber was a native of Spain, or at least lived at Seville, but this has probably arisen from confusing Geber, the chemist, with other persons of the same or similar name.

GEBWELLER, in French *Guebwiller*, a town of the German imperial province of Alsace-Lorraine, in the district of Upper Alsace, situated about thirteen miles south of Colmar, at the mouth of the Blumenthal, or "Vale of Flowers." Population, 12,000.

GECKO, the common name applied to all the species of *Geckotida*, an extensive family of lizards belonging to the Pachyglossae, or "thick-skinned" sub-order of Gray. The geckoes are small creatures, seldom exceeding eight inches in length, including the tail. With the head considerably flattened, the body short and thick, the legs not high enough to prevent the body dragging somewhat on the ground, the eyes large and almost destitute of eyelids, and the tail short, and, in some cases, nearly as thick as the body, the geckoes, altogether, lack the liteness and grace characteristic of most lizards. The colors also are dull, and to the weird and forbidding aspect thus produced the general prejudice against those creatures in the countries where they occur, which has led to their being classed with toads and snakes, is no doubt to be attributed. Their bite was supposed to be venomous, and their saliva to produce painful cutaneous eruptions; even their touch was thought sufficient to convey a dangerous taint. It is needless to say that in this instance the popular mind was misled by appearances. The geckoes are not only harmless, but are exceedingly useful creatures, feeding on insects and worms, which, owing to the great width of the oesophagus, they are enabled to swallow whole, and in pursuit of which they do not hesitate to enter human dwellings, where they are often killed on suspicion.

GED, WILLIAM, the inventor of the art of stereotyping, was born at Edinburgh about the beginning of the eighteenth century. In 1725 he first put in practice the art which he had discovered; and some years later he entered into a partnership with a London capitalist, with a view to employing it on a great scale. The partnership, however, turned out very ill; and Ged, broken-hearted at his want of success, died at London, October 19, 1749. The only books which he produced by means of stereotyping were two prayer-books for the university at Cambridge, and an edition of Sallust.

GEDDES, ALEXANDER, a learned theologian, biblical critic, and miscellaneous writer, was born at the farm of Arradoul, in the parish of Rathven, Banffshire, Scotland, September 14, 1737. After a visit to Paris which extended over some months, and which was employed by him in reading and making extracts from rare books and manuscripts in the public libraries, he in 1769 was appointed to the charge of the Catholic congregation of Auchinhalrig in his native country. During a period of a ten years' incumbency there he displayed a liberality of spirit which caused considerable scandal to his stricter brethren; and the freedom with which he fraternized with his Protestant neighbors once and again called forth the rebuke of his bishop (Hay). Ultimately, on account of his occasional attendance at the parish church of Cullen, where his friend Buchanan was minister, he was deprived of his charge and forbidden the exercise of ecclesiastical functions within the diocese. This happened in 1779; and

in 1780 he went with his friend Lord Traquair to London, where he spent the rest of his life, with the exception of a few weeks devoted to travel on the Continent. Dr. Geddes was engaged on a critical translation of the Psalms, which he had completed down to the 118th, when he was seized with a lingering and painful illness which ultimately proved fatal on February 27, 1802.

GEELONG, one of the leading towns in Victoria, coeval with Melbourne in the history of Australian settlement, is pleasantly situated on Corio Bay, an extensive western arm of Port Philip, forty-five miles southwest of Melbourne. Population (1901) 23,410.

GEESTEMUNDE, a seaport in the Prussian province of Hanover, in the district or *Landdrostei* of Stade, situated, as the name indicates, at the mouth of the Geeste, a right-hand affluent of the estuary of the Weser. Population about 13,000.

GEFLE, Latinized as *Gevalia*, a seaport town of Sweden, at the head of Gefleborglan, about a mile from the shore of the gulf of Bothnia, near the mouth of the Gefle—A, fifty miles east of Fahlun, and about the same distance north of Upsala. Population 17,250.

GEHENNA is the Greek form of the Hebrew *Gehinnom* (Valley of Hinnom), or *Ge-ben-Hinnom* (Valley of the Son of Hinnom). This valley, or rather gorge—for it is described as very narrow, with steep and rocky sides—lies south and west of the city of Jerusalem. Here Solomon built a high place for Moloch (I. Kings xi, 7), and, in fact, Gehenna appears to have become a favorite spot with the later Jewish kings for the celebration of idolatrous rites. It was here that Ahaz and Manasseh made their children pass through the fire, and at the southeast extremity, specifically designated Tophet (place of burning), the practice of infant sacrifice to the fire gods was not unknown (Jeremiah vii, 31). Among the later Jews, Gehenna and Tophet came to be regarded as symbols of hell and torment, and in this sense the former word is frequently employed by our Savior in the New Testament.

GEIGER, ABRAHAM, one of the ablest leaders of the modern Jewish school of theology and criticism, was born at Frankfurt-on-the-Main, May 24, 1810. In 1863 Geiger became head of a synagogue of his native town, whence he removed in 1870 to Berlin, where, in addition to his duties as chief rabbi, he took the principal charge of the newly established seminary for Jewish science. The *Urschrift* was followed by a more exhaustive handling of one of its topics in *Die Sadducäer und Phariseer* (1863), and by a more thoroughgoing application of its leading principles in an elaborate history of Judaism (*Das Judenthum u. seine Geschichte*) in 1865-71. From 1862 until his death (which occurred October 23, 1874) he was editor of a periodical entitled *Judische Zeitschrift für Wissenschaft und Leben*.

GEIJER, ERIK GUSTAF, Sweden's greatest historian, was born at Ransäter in Värmland, January 12, 1783, of a family that had immigrated from Austria in the time of Gustavus Adolphus. At sixteen he left Carlstad gymnasium for the university of Upsala, where in 1803 he carried off the Swedish Academy's great prize for an *Arminne öfver Riksförstandaren Sten Sture*. He graduated in 1806, and in 1810 returned from a year's residence in England to become "docent" in his university. Soon afterward he accepted a post in the public record office of Stockholm, where, with eleven friends, he founded the "Gothic Society." Geijer's lyric muse was soon after silenced by his call to be assistant to Fant, professor of history of Upsala (1815), whom he succeeded in that chair in 1817. In

1824 he was elected to the Swedish Academy. A single volume of a great projected work, *Svea Rikes Höfder*, itself a masterly critical examination of the sources of Sweden's legendary history, appeared in 1825. Geijer's researches in its preparation had severely strained his health, and he went the same year on a tour through Denmark and part of Germany, his impressions from which are recorded in his *Minnen* (1834). In 1832-36 he published three volumes of his *Svenska folkets historia*, a clear view of the political and social development of Sweden down to the close of Queen Christina's reign. The acute critical insight, just thought, and finished historical art of these two incomplete works of Geijer entitle him to the first place among Swedish historians. He died in 1847.

GEIKIE, WALTER, a Scotch subject-painter, was born at Edinburgh, November 9, 1795. He first exhibited in 1815, and was elected an associate of the Royal Scottish Academy in 1831, and a fellow in 1834. He died on August 1, 1837, and was interred in the Greyfriars Church, Edinburgh. Owing to his want of feeling for color, Geikie was not a successful painter in oils, but he sketched in India ink with great truth and humor the scenes and characters of Scottish lower-class life in his native city.

GEILER, or GEYLER, VON KAISERSBERG, JOHANN, one of the greatest of the popular preachers of the fifteenth century, was born at Schaffhausen, March 16, 1445. A living interest in theological subjects, which had been awakened within him by the study of Gerson, led in 1471 to his removal to the university of Basel, at that period a center of attraction to some of the most earnest spirits of the times. Made a doctor of theology in 1475, he received a professorship at Freiburg in the following year. Ultimately he accepted in 1478 a call to the cathedral of Strasburg, where he continued to work with few interruptions until within a short time of his death, which occurred on March 10, 1510.

GEISSLER, HEINRICH, a distinguished practical physicist, was born at the village of Igelshieb in Saxe-Meiningen, Germany, where he was educated as a glass-blower. After many years spent in traveling from city to city in the exercise of his craft, he settled at Bonn, where he speedily gained a high reputation, not only for his surpassing skill and ingenuity of conception in the fabrication of physical apparatus, but for his comprehensive knowledge, acquired chiefly in later life, of the natural sciences. He is best known as the inventor of the sealed glass tubes which bear his name, by means of which are exhibited the phenomena accompanying the discharge of electricity through highly rarefied vapors and gases. Among other apparatus contrived by him are his vaporimeter, mercury air pump, balances, normal thermometer, and areometer. From the university of Bonn, on the occasion of his jubilee, he received the honorary degree of doctor of philosophy. He died on January 24, 1879, in the sixty-fifth year of his age.

GELA, an ancient city on the south coast of Sicily, on a river of the same name, near the site of the modern Terranova between Girgenti and Camarina.

GELASIUS, the name of two popes.

GELASIUS I. succeeded Felix III. in 492, and confirmed the estrangement between the Eastern and Western Churches by insisting on the removal of the name of Acacius, bishop of Constantinople, from the diptychs. He was also the first decidedly to assert the supremacy of the papal over the imperial power, and the superiority of the pope to the general councils. Gelasius died in 496, and was canonized, his day being November 18th.

GELASIUS II. (Giovanni da Gaeta) was of noble de-

cent, and was born at Gaeta about 1050. On the death of Pascal II. he was elected pope by the cardinals, January 18, 1118, and when his person was seized by Cencius Frangipani, a partisan of the emperor Henry V., he was almost immediately set at liberty through the general uprising of the people in his behalf. The sudden appearance of the emperor, however, compelled him to leave Rome for Gaeta, and the imperial party chose an anti-pope, Burdinus, archbishop of Braga, under the name of Gregory VIII. Gelasius, at a council held at Capua, fulminated bulls of excommunication against his ecclesiastical rival and the emperor; and under the protection of the Norman princes he was able to return to Rome, where he staid for a time in partial concealment, but having barely escaped capture by the Frangipani while celebrating mass in the church of St. Praxedes, he left the city, and after wandering through various parts of Italy and France died in the abbey of Clugny, January 19, 1119.

GELATIN. When intercellular connective tissue, as met with in skin, tendons, ligaments, and the fasciæ of the muscles, of which it forms the basis, is treated with water, preferably hot, or in presence of dilute acids, for some time, a solution is obtained which in cooling solidifies to a jelly. The dissolved substance bears the name of *Gelatin* or *Glutin*.

The same substance is obtained when the matrix of bones is submitted to similar treatment, after previous removal of the lime salts by means of mineral acids. Again, when unossified cartilage, as for instance the bone-cartilages of the vertebrate foetus, is treated with water or dilute acids, a solution is obtained which also gelatinizes on cooling. The coagulation in this case, however, is due, not to gelatin, but to a closely allied substance called chondrin.

True gelatinous tissue occurs in all mature vertebrates, with the single exception, according to Hoppe-Seyler, of that in other respects anomalous vertebrate, *Amphioxus lanceolatus*. In the embryo it does not appear till late in foetal life, chondrin being found instead; and the change which brings gelatin into the place of chondrin is effected, not by a metamorphosis of the latter, but by its removal, and the independent formation of gelatin. Gelatin, as such, is not met with in any of the normal fluids of the body, but occurs in the blood in cases of *leukæmia*.

Various qualities of impure gelatin are prepared on the large scale by boiling up the hides of oxen, skins of calves, and spongy parts of horns; from any of the crude gelatins the pure substance may be obtained by bleaching with sulphurous acid and steeping repeatedly in warm water, when in the state of soft jelly.

Pure gelatin is an amorphous, brittle, nearly transparent substance, faintly yellow, tasteless, and inodorous, neutral to vegetable colors, and unaltered by exposure to dry air.

Nothing is known with any certainty as to its chemical constitution, or of the mode in which it is formed from albuminoids.

According to Wanklyn, gelatin is distinctly differentiated from such substance as *casein* and *albumin* by a marked difference in behavior when treated successively with boiling potash and alkaline permanganate.

Although gelatin in a dry state is unalterable by exposure to air, its solution exhibits, like all the proteids, a remarkable tendency to putrefaction; but a characteristic feature of this process in the case of gelatin is that the solution assumes a transient acid reaction. The ultimate products of this decomposition are the same as are produced by prolonged boiling with acid. It has been found that oxalic acid, over and above the action common to all dilute acids of preventing the solidifica-

tion of gelatin solutions, has the further property of preventing in a large measure this tendency to putrefy when the gelatin is treated with hot solutions of this acid, and then freed from adhering acid by means of carbonate of lime. Gelatin so treated has been called *metagelatin*.

Strange to say, in spite of the marked tendency of gelatin solutions to develop ferment-organisms, and undergo putrefaction, the stability of the substance in the dry state is such that it has even been used, and with some success, as a means of preserving perishable foods.

Gelatin has a marked affinity for water, abstracting it from admixture with alcohol, for example. Solid gelatin steeped for some hours in water absorbs a certain amount and swells up, in which condition a gentle heat, as that of the water-bath, serves to convert it into a liquid; or this may be readily produced by the addition of a trace of alkali or mineral acid, or by strong acetic acid. In the last case, however, or if we use the mineral acids in a more concentrated form, the solution obtained has lost its power of solidifying, though not that of acting as a glue. By prolonged boiling of strong aqueous solutions at a high, or of weak solutions at a lower temperature, the characteristic properties of gelatin are impaired and ultimately destroyed. After this treatment it acts less powerfully as a glue, loses its tendency to solidify, and becomes increasingly soluble in cold water; nevertheless the solutions yield on precipitation with alcohol a substance identical in composition with gelatin.

By prolonged boiling in contact with hydrolytic agents, such as sulphuric acid or caustic alkali, it yields quantities of *leucin* and *glycocoll* (so-called "sugar of gelatin," this being the method by which glycocoll was first prepared), but no *tyrosin*. In this last respect it agrees with its near allies, chondrin and elastin, and differs from the great body of proteids, the characteristic solid products of the decomposition of which are leucin and tyrosin. At the same time the formation of glycocoll differentiates it from chondrin, from which, moreover, it can be readily distinguished by its non-precipitability by acetate of lead.

When it is mixed with copper sulphate a bright green liquid is formed, from which the copper cannot be thrown down free of organic matter. Addition of potash to the liquid merely changes the color from green to violet, which by boiling is further transformed into a pale red, but without any precipitation of hydrate. Hence the inapplicability of Trommer's sugar test in presence of gelatin, the cuprous oxide being soluble in gelatin solutions.

Treated with strong oxidizing agents, such as a mixture of sulphuric acid and bichromate of potash, or binocide of manganese, it exhibits a close resemblance in behavior to casein, formic and valeric acids being the principal products, along with a small quantity of benzoic aldehyde. When solution of gelatin is mixed with chromate of potash alone, it forms a medium very sensitive to light, which converts it into an insoluble yellow mass.

As bones are capable of yielding one-third of their weight of solid gelatin, it follows that, if gelatin had a value equivalent to albuminoids, the bones of an animal would contain one-fifth of the total nutritive material in its body. Accordingly, at a time when gelatin was in high esteem for its food-value, recourse was had largely to this source, more especially in France, for a cheap, nutritive soup for soldiers, pauper establishments, and hospitals. To prepare such a soup the bones may be either simply boiled in water under pressure, as in a Papin's digester, or without pressure, or they may be

previously freed from salts of calcium by treatment with dilute hydrochloric acid. On the large scale the crushed bones are submitted to the combined action of steam at high pressure and a current of water percolating through the fragments. The bones, preferably in a fresh condition, or preserved by thorough drying or by antiseptic agents such as brine, are crushed by passing them between solid iron cylinders grooved longitudinally and kept revolving. They are then packed into a cylindrical cage, which can be lowered into a cylindrical jacket of rather larger diameter than itself, the whole closing with a well-fitting lid. A pipe for the entrance of water, regulated by a stopcock, projects from the top of the outer cylinder, and is connected before the lid is put on with an adjustable nozzle, through which the water trickles down among the caged bones. Another pipe is connected with the bottom of the apparatus for the passage of high-pressure steam. The gelatin solution may be removed at intervals by means of a stopcock at the bottom. The quantity of water percolating through the bones is carefully regulated in accordance with the varying pressure of the steam, so as to produce a soup of nearly uniform consistence.

Isinglass.—Isinglass or fish glue, in its raw state, is the swimming-bladder or sound of various species of fish. The sounds undergo no other preparation than careful drying, but in the drying they are variously treated and made up, so that the isinglass comes into commerce under the names of "leaf," "staple," "book," "pipe," "lump," "honeycomb," and other designations, according to its form. The finest isinglass, which comes from Russia, is prepared by cutting open the sounds, steeping them in water until the outer membrane separates from the inner, then washing the latter and exposing it to dry in the air. Russian isinglass is obtained from several species of sturgeon (*Acipenser*), found in the Volga and other tributaries of the Caspian Sea, in the Black Sea, and in the Arctic Ocean. Brazilian isinglass, obtained from Brazil and Guiana, is the produce of a large fish, *Silurus parkerii*, and probably some other species; and Manila and East Indian isinglass are yielded by species of fish not yet satisfactorily determined. The sounds of the common cod, the hake, and other *Gadidae* are also used as a kind of isinglass. The principal uses to which isinglass is applied are for jellies and confections, and as a clarifying or filtering medium for wine, beer, and other liquids. When used for culinary and confectionery purposes, isinglass is rolled into thin sheets and cut into fine shreds to facilitate its solution. For clarifying liquids its fibrous structure is of great value, as it forms a fine network in the liquid in which it is disseminated, and thereby mechanically carries down all the minute particles which render the liquid thick and turbid. Isinglass dissolved in strong acetic acid forms a powerful cement, much used for repairing glass, pottery, and similar small objects.

Uses of Gelatin.—The gelatin derivable from bones enters very largely into human food, in the stock for soups, etc., and as prepared gelatin, "calves'-foot jelly," and isinglass. In addition to the uses already alluded to, gelatin has many other applications in the arts. It is employed as a sizing agent in paper-making, and by painters it is also used for sizing or priming, and for preparing tempera colors. Further, it is used in the preparation of elastic molds of undercut work, and in the manufacture of inking rollers for printing. Gelatin treated with bichromate of potash, under the influence of light, undergoes a remarkable chemical and physical change, whereby it is rendered entirely insoluble and insoluble by water. The change is due to the oxidizing effect of the bichromate; and the circumstance

has given rise to the numerous so-called carbon-processes introduced into photography by Swan, Johnson, Woodbury, Albert, Edwards and others, in all of which an image is produced in gelatin oxidized by chromium compounds. As insoluble glue may be prepared by adding to dissolved glue, just before using, a proportion of a solution of bichromate of potash, and such a preparation forms a useful waterproofing medium. Glue may be kept liquid at ordinary temperatures by the addition of concentrated acetic acid or of weak nitric acid. Dumoulin's liquid glue, which possesses powerful adhesive properties, is composed of glue in the proportion of 2 lbs. dissolved in 1 quart of water with 7 ozs. of nitric acid (sp. gr. 1.335) added. Mouth or lip glue is prepared by adding $\frac{1}{2}$ lb. or thereabouts of sugar to each pound of dissolved glue. It forms solid but easily dissolved cakes, and as it can be sufficiently softened by the tongue, it is for many purposes extremely convenient. Transparent gelatin, brightly colored by dyeing substances, and cast in excessively thin sheets, is largely used for ornamental wrappings for bon-bons, etc.

GELDERLAND, GELDERN. See **GUELDERLAND, GUELTERS.**

GELÉE, CLAUDE. See **CLAUDE OF LORRAINE.**

GELL, SIR WILLIAM (1777-1836), classical scholar and antiquarian, was born at Hopton, in Derbyshire, in 1777. He died at Naples in 1836. His drawings, representing a very large series of views of classical ruins and localities, and executed, if not with much artistic skill, yet with great detail and exactness, are now in the print room of the British Museum.

GELLERT, CHRISTIAN FÜRCHTEGOTT, German fabulist, hymn-writer, and moral philosopher, was born July 4, 1715, at Hainichen in the Saxon Erzgebirge. He was educated at the university of Leipsic, where in 1751, he was appointed an extraordinary professor of philosophy, a position which he occupied till his death, December 13, 1769.

GELLIUS, AULUS, author of the *Noctes Atticæ*, was born in the first half of the second century of the Christian era, most probably in Rome, and died about 180. Nothing is known of his personal history except from incidental notices in his own book.

GELON succeeded Hippocrates as tyrant of Gela in 491 B.C., and by supporting the plebs of Syracuse in their quarrels against the aristocracy, became tyrant also of that city in 485 B.C. He used his power so discreetly that under him Syracuse attained an extraordinary degree of wealth and influence.

GELSEMIUM, a drug, consisting of the root of *Gelsemium*, a climbing shrub of the natural order *Loganiaceæ*. The plant is a native of the United States, growing on rich clay soil by the side of streams near the coast, from Virginia to the south of Florida. In the United States it is commonly known as the wild, yellow, or Carolina jessamine, although in no way related to the true jessamines, which belong to the *Oleaceæ*.

The pharmaceutical preparation known as gelsemin consists chiefly of the resin, combined with uncertain proportions of the other constituents of the root, and is prepared by precipitation with water from the strong tincture.

The medicinal properties of the root were discovered by accident, the infusion having been administered instead of that of some other root, with the result of curing the fever for which it was taken. It has attracted considerable attention in England as a remedy for certain forms of facial neuralgia, especially those arising from decayed teeth, or involving branches of the fifth nerve. In the United States it is more particularly valued for con-

rolling nervous irritability in fevers of a malarial type, in which it is said to excel every other known agent. It is also used in obstetric practice, causing or aiding in the dilation of the os uteri in cases of childbirth. The dose is from one-sixtieth to one-twentieth grain of the alkaloid. In large doses it produces alarming symptoms, which occasionally terminate fatally. These appear to vary slightly in different cases, but the more prominent are pain in the forehead and in the eyeballs, giddiness, ptosis, a feeling of lightness in the tongue, slurred pronunciation, labored respiration, wide dilatation of the pupils, and impossibility of keeping an erect posture. The mind in most cases remains clear until shortly before death. The earliest and most prominent symptom of a fatal or dangerous dose is the drooping of the eyelids, which indicates the immediate administration of stimulants, for when the paralysis of the tongue which ensues extends to the epiglottis, deglutition becomes impossible, and the epiglottis is apt, unless the sufferer be placed in a forward position, to flap back and close the windpipe. The antidotes which have been found the most successful are brandy, aromatic spirits of ammonia (teaspoonful in water), tincture digitalis (from 10 to 30 drops in water), and morphia ($\frac{1}{8}$ to $\frac{1}{2}$ grain). It has been found that death may be averted by keeping up artificial respiration until the poison is eliminated by the kidneys.

GEMINIANI, FRANCESCO, a celebrated violinist, born at Lucca about 1680. In 1714 he arrived in London, where his performance and compositions attracted much attention. In 1761 he went to Dublin, where a servant robbed him of a musical manuscript on which he had bestowed much time and labor. His vexation at this loss is said to have hastened his death, which took place at Dublin on September 17, 1762.

GEMISTUS, or PLETHO, GEORGIUS, held high office under the Byzantine emperors during the first half of the fifteenth century, and derived his name, which signifies the Replete, from the extraordinary amount of his erudition. He is, however, chiefly memorable for having been the first person who introduced Plato to the Western world. This took place upon his visit to Florence in 1438, as one of the deputies from Constantinople on occasion of the general council.

GEMS, engraved with designs, whether adapted for sealing, or mainly for artistic effect, exist in a very large number of undoubtedly genuine examples, extending from the mists of Babylonian antiquity to the decline of Roman civilization, and again starting with a new but unnatural impulse on the revival of art. Apart from workmanship they possess the charms of color deep, rich and varied, of material unequaled for its endurance, and of scarcity which in many instances has been enhanced by the strangeness of the lands whence they came, or the fortuity of their occurrence. These qualities united within the small compass of a gem were precisely such as were required in a seal as a thing of constant use, so inalienable in its possession as to become naturally a personal ornament and an attractive medium of artistic skill, no less than the center of traditions or of religious and legendary associations. As regards the nations of classical antiquity all seals are classed as gems, though in many cases the material is not such as would strictly come under that heading. On the other hand, gems properly so called were not always seals. Many of the Babylonian cylinders could not have been so employed without great difficulty, and when Herodotus speaks of every Babylonian wearing a seal, it may have been in most cases no other than a talisman having an inherent power derived from the subject of its design, consisting perhaps mostly of figures of protecting deities. He adds that every Babylonian carried also a staff on which it was unlawful

for him not to have the figure of an apple, a rose, a lily, an eagle, or something else, as his badge, from which it may perhaps be inferred that having selected some such badge for his staff he would necessarily have the same for the seal with which he attested his name. But if that had been the case, then the great mass of existing cylinders could not have been seals in the ordinary sense. In Greece and Rome within historic times, gems were worn engraved with designs to show that the bearer was an adherent of a particular worship, the follower of a certain philosopher, or the attached subject of an emperor. It cannot be said that these gems may not have been used systematically as seals, but it is clear that they primarily served a different purpose. Again, when the sense of personal ornament naturally attaching to a seal increased, and the resources both of material and skill were enlarged, the process of engraving gems in cameo, that is, with the design in relief mostly in such stones as by their differently colored layers could be made to present a variety of surfaces, came largely into fashion. As a rule these cameos are of a date subsequent to that of Alexander the Great; but there are exceptions in an Egyptian cameo in the Louvre, said to belong to the twelfth dynasty, about 3000 B.C., and in some few Etruscan scarabs, which, having designs in intaglio on the face, have also reliefs engraved on the back, apparently in the same archaic manner of art as the intaglios. Such a scarab in carnelian was found at Orvieto in 1874 in a tomb along with vases dating from the beginning of the fifth century B.C., and it can be seen from the engraving of this gem, that while the design on the face presents evidently the same subject which occurs on a scaraboid found in the treasury of Curium in Cyprus by General Cesnola, the half-length figure of a Gorgon on the back seems to be the same in subject and treatment as a carnelian fragment, apparently cut from the back of a scaraboid, now in the British Museum.

In Egypt the favorite form of gem was a scarab (beetle), having a flat surface underneath, on which was engraved a hieroglyphic design. The common materials are green jasper and porcelain. From the soft nature of the porcelain, and from the strict adherence to the scarab shape, it may be inferred that they were used much less as seals than as a sort of badges or ornaments, and this is confirmed by the finding of large numbers of them in foreign countries, as at Camirus in Rhodes and in Etruria, where the hieroglyphics could not have been understood. No doubt it may be true that these specimens had been manufactured by Phœnicians for export to those countries merely as articles of ornament, but had the originals been strictly held by the Egyptians to be seals, it would have been the height of dishonesty in the Phœnicians to reproduce them in this way. In Egypt, however, the art of gem engraving was not confined altogether to scarabs, as may be seen among other interesting exceptions in the oblong intaglio of green jasper in the Louvre with a design on both sides, representing on the obverse, as known from the cartouche, Thothmes II. (1800 B.C.) slaying a lion, and on the reverse the same king drawing his bow against his enemies from a war chariot. In the Louvre also is an Egyptian gem, said to belong to the twelfth dynasty, 3000 B.C. But uninteresting in themselves as are the scarabs of Egypt, they have this accidental importance in the history of gem engraving that they furnished the Phœnicians with a model which they first improved as regards the intaglio by a freer spirit of design, gathered partly from Egypt and partly from Assyria (see the Phœnician scarabs from Tharras in Sardinia and from Cyprus).

The records of gem engravers in Greece begin in the

island of Samos, where Mnesarchus, the father of the philosopher Pythagoras, earned by his art more of praise than of wealth. Thence also came Theodorus, who made for Polycrates the seal of emerald, which, according to the curious story, was cast in vain into the deep sea on purpose to be lost. That the design on it was a lyre, as is stated in one authority, is unlikely, now that Benndorf's ingenious reading of Pliny has shown that the portrait statue of Theodorus made by himself was in all probability a figure holding in one hand a graving tool, and in the other, not, as previously supposed, a quadriga so diminutive that a fly could cover it with its wings, but a scarab with the engraving of a quadriga on its face, whence it is not unreasonable to conclude that this scarab in fact represented the famous seal of Polycrates. Shortly after 600 B. C. there was a law of Solon's forbidding engravers to retain impressions of the seals they made, and this date would fall in roundly with that of Theodorus and Mnesarchus, as if there had in fact been just about then a special activity and unusual skill. That the art had been practiced perhaps for several centuries before in Greece is probable from the general usage of sealing implied in Solon's law, from the extraordinary degree to which it obtained soon after his time, and from the influence which was exercised on the Greeks in such matters by the Phœnicians, Egyptians, and Assyrians.

From the time of Theodorus to that of Pyrgoteles in the fourth century B. C., is a long blank as to names, but not altogether as to gems, the production of which may be judged to have been carried on assiduously from the constant necessity of seals for every variety of purpose. The references to them in Aristophanes, for example, the lists of them in the ancient inventories of treasures in Athens, and the number of them found by General Cesnola in the treasure chambers of Curium, in Cyprus, confirm this frequent usage during the period in question.

GEMSBOK, a species of antelope, abounding on the dry yet fertile plains of South Africa, where it feeds on the bulbs of water-root and other kinds of succulent vegetation, by means of which the antelopes of those regions are able to subsist without water for months together. It is a large and powerful animal, measuring about five feet in length and over three feet in height at the shoulders. Its horns, situated on the same plane with its forehead, exceed two feet in length, are almost straight, and are obscurely ringed throughout their lower half. The color of the upper part of the body is a rusty gray, and of the under part white, while these are separated from each other by a well-defined black band on each side. These bands unite on the breast, and are continued as a single black band until reaching the lower jaw, when they again divide and form two transverse bands on the head, terminating at the base of the horns. The head otherwise is white, as also are the limbs, with the exception of the thighs, which are black. The striking appearance presented by this antelope is in great part due to the absence of any blending in the different colors of its body. The gemsbok avoids the woods, living on the open plains in pairs or in small groups of four or five. Possessing powerful weapons of attack in its long, spear-like horns, and with ample courage to use them, this animal, especially when wounded, is a formidable antagonist both to man and to the numerous beasts of prey which are attracted to the karroos of the Cape by the presence of this and other ruminant species. It is said to defend itself not infrequently with success against the lion. Its flesh is esteemed as a delicacy, and its hide forms a valuable leather.

GENDARMERIE, a body of troops or police in

France, composed of *gendarmes*, or men-at-arms. In the days of chivalry they were mounted and armed cap-a-pie, and attended each by five soldiers of inferior rank and more lightly armed. They were then furnished by the fiefs, and marched in the train of the knights and esquires. In 1439 this feudal gendarmerie was replaced by the *compagnies d'ordonnance* which Charles VII. formed when the English were driven out of France, and which were distributed throughout the whole extent of the kingdom for preserving order and maintaining the king's authority. These companies, fifteen in number, were composed of 100 lances or gendarmes fully equipped, each of whom was attended by at least three archers, one *coillier* (soldier armed with a cutlass) and one *varlet* (soldier's servant). The states-general of Orleans (1439) had voted a yearly subsidy of 1,200,000 livres in perpetuity to keep up this national soldiery, which replaced the bands of mercenaries who for about a century had made France their prey. The number and composition of the *compagnies d'ordonnance* were changed more than once before the reign of Louis XIV. This sovereign on his accession to the throne found only eight companies of gendarmes; but after the victory of Fleurus (1690), which had been decided by their courage, he increased their number to sixteen. The four first companies were designated by the names of *Gendarmes écossais*, *Gendarmes anglais*, *Gendarmes bourguignons*, and *Gendarmes flamands*, from the nationality of the soldiers who had originally composed them; but at that time they consisted entirely of French soldiers and officers. These four companies had a captain-general, who was the king. The fifth company was that of the queen; and the others bore the names of the princes who respectively commanded them. This organization lasted till 1787, when Louis XVI. dissolved it, only retaining the *Gendarmes écossais* in his body-guard. The great Revolution swept away all these institutions of the monarchy, and, with the exception of a short revival of the *Gendarmes de la garde* at the Restoration, the word gendarmerie had thenceforth an altogether different meaning. It has been, since that time, employed to denote a military police, whose duties are to watch over the public safety, keep order, and enforce the execution of the laws. This police force superseded the old *maréchaussée*.

GENDER (Fr. *gendre*, from Lat. *genus*, *generis*, race, kind), in Grammar, is a distinction among words depending upon sex. Names applied to the male sex are said to be of the *masculine* gender, as *man*, *poet*; those applied to the female sex *feminine*, as *woman*, *poetess*; words that are neither masculine nor feminine are, as it were expressed in Latin, *neutrus generis*, "of neither gender"; and from this phrase grammarians have come to speak, somewhat incorrectly, of this class of words as being "of the neuter gender," and hence to reckon three genders. In English, the distinction of gender in nouns is chiefly marked in the pronouns substituted for them—*he*, *she*, *it*. Gender, strictly speaking, is applicable only to living beings distinguishable as male and female; but by the figure of speech called personification, inanimate objects are often spoken of as *he* and *she*. In Latin, Sanskrit, and Greek there were objects of *neutrus generis*.

GENEALOGY. The word "genealogy" which occurs twice in the New Testament, in the ordinary concrete sense of "pedigree" or "list of ancestors," is of somewhat frequent occurrence in the authorized version of the Old Testament scriptures. The scripture genealogies, properly so called, begin with the antediluvian period, and indeed with "the generations (or genealogy) of the heavens and of the earth." The descendants of Adam are traced through the lines of Cain and of

Seth respectively to the seventh and to the ninth generation.

With reference even to the most undisputed of the Biblical genealogies, it is important to remember, in the first place, that in them phrases implying sonship are not to be interpreted so strictly as they would be with us; and, secondly, that, in order to aid the memory by means of successions of symmetrical numbers, it was quite usual to manipulate a long list by dropping or even by introducing names at discretion.

The great antiquity of the early Roman (patrician) gentes is indisputable; and the rigid exclusiveness with which each preserved its *hereditates gentilitie* or *sacra gentilitia* is sufficiently illustrated by the fact that toward the close of the republic there were not more than fifty patrician families. Yet even in these it is obvious that, owing to the frequency of resort to the well-recognized practice of adoption, while there was every guarantee for the historical identity of the family, there was none (documents apart) for the personal genealogy of the individual.

The passion for genealogizing, which has been and is a marked characteristic of all the aristocracies of modern Europe, can be directly traced to the influence of feudalism and the principles of hereditary privilege which that system, in its later phases at least, so peculiarly encouraged. Along with the sharp separation of those families which alone were regarded as capable of holding real property or filling the higher offices of state, or indeed of engaging in any of what were reckoned as the more ennobling pursuits of life, arose the necessity for being able to determine with accuracy who were and who were not the persons entitled by birth to take a place within the privileged caste. As they forced their way up the stream of time, indeed, they were met at a comparatively early stage by a great barrier—consisting in the paucity and inaccessibility of authentic documents than in what one might almost call the fatal fact of the absence of family names. Prior to the middle of the eleventh century these were entirely unknown; the documents speak merely of Eberhardus, Fridericus, Ernestus and the like, with at most the addition of the title. About 1050 began the custom of using surnames, but it made way so very slowly that, even at the close of the twelfth century, it had not diffused itself beyond the ranks of the higher nobility, and throughout the thirteenth the old habit of self-designation by the Christian name merely was still exemplified in a vast number of instances. At present, if we understand by a genealogy a tabulated and, as far as possible, an exhaustive statement of all the ramifications of a series of human generations, and by genealogical science that branch of history which aims at securing fullness and accuracy in the accounts men give of the antecedents of families which have attained to distinction, the modern genealogist cannot but be conscious that he occupies a comparatively narrow field, and one from which the larger interests of mankind are daily further receding. In the more ancient meaning of the word genealogy indeed, when it is used to denote that grander task of the historian which consists in tracing the origin, not of privileged families or castes merely, but of races and groups of races, and even of the species itself, the subject is one that has an ever widening and deepening significance; but in this sense it does not call for treatment apart from the biological sciences.

GENELLI, GIOVANNI BUONAVENTURA, was born at Berlin, September 28, 1798, and died at Weimar, November 13, 1868. In 1859 he was appointed a professor at Weimar, where he ended his days. Genelli painted few pictures, and it is very rare to find his canvases in public galleries.

GENERATION, a term in general biology or physiology, may comprehend the whole history of the first origin and continued reproduction of living bodies, whether plants or animals; but it is frequently restricted to the sexual reproduction of animals.

GENESIS. See PENTATEUCH.

GENET (*Genetta*), a genus of carnivorous mammals belonging to the *Viverride* or family of civets. It contains six species, all of which are found exclusively in Africa, with the exception of the common genet (*Genetta vulgaris*), which occurs also throughout the south of Europe and in Palestine, where Tristram notes it as occurring on Mount Carmel. The fur of this species is of a dark gray color, thickly spotted with black, and having a dark streak along the back, while the tail, which is nearly as long as the body, is prettily ringed with black and white. The genet is abundant in the south of France and in Spain, where it frequents the banks of streams, and feeds on the smaller mammals and on birds.

GENEVA, a city and canton of Switzerland—the canton being, with one exception, the smallest, and the city, without exception, the largest within the limits of the confederation.

The canton of Geneva has an area of 107.8 square miles. The greater part of its frontier is conterminous with France, the department of Haute-Savoie lying to the south, and that of Ain to the west and north; while it is connected with the Swiss canton of Vaud (Waadt) along a line of more than three and one-half miles.

The city of Geneva is situated at the southwestern extremity of the beautiful lake of the same name, whence the noble current of the Rhone flows westward under the five bridges by which the two halves of the town communicate with each other. The actual site of the town, apart from the river and the lake, is not so picturesque as that of many other places in Switzerland. Though the central plateau, crowned as it is by the cathedral, gives certain relief to the general view from the water, a large proportion of the town is built on the alluvial flats along the river. But what Geneva lacks in picturesqueness it now makes up in an appearance of prosperity and comfort—presenting fine quays, well-ordered pleasure grounds, good streets, and substantial houses, and, in the number and extent of its modern suburbs, giving evidence that its prosperity is not a thing of the past. Population (1901), 105,139.

GENEVA, THE LAKE OF (the Latin *Lacus Lemanus* or Lake Lemman, also known in the Middle Ages as Lac Losannete or Lake of Lausanne, and as Mer du Rhône or Sea of the Rhone), is the largest of the Swiss lakes, having an area of 223 square miles. Its general form is that of a crescent, the northern shore being almost the arc of a circle, with a radius of twenty-one and one-half miles. The eastern end of the crescent is broad and rounded, while the western tapers toward Geneva. Its maximum breadth, between Morges and Amphion, is eight and one-half miles. It is divided into two portions, the Great and Little Lake, by the strait of Promonthoux, which is not much more than two miles across. The Great Lake is thirty-nine miles long, with a mean breadth of six miles, and the Little or Western Lake is fourteen miles long, with a mean breadth of rather more than two miles.

GENEVA, growing town of Ontario county, N. Y., is beautifully situated at the north end of Seneca Lake, on the New York Central Railway and at the terminus of the Ithaca branch railway, fifty-two miles east-southeast of Rochester. It has banking and telegraph facilities, and a population (1900) of 10,433.

GENEVA AWARD is the name popularly applied to the sum of £3,229,166, paid by Great Britain as

indemnity for injuries inflicted by the Confederate Cruiser "Alabama," which had been allowed to sail from a British port in defiance of international law, in the year 1862. The award was made by a commission appointed by the President, the Queen, the king of Italy, the emperor of Brazil, and the Swiss president, and was devoted to paying for private property destroyed by the rebel ship.

GENEVA CONVENTION, an agreement concluded at an international conference which was held at Geneva in 1864, under the presidency of General Dufour the Swiss plenipotentiary, for the purpose of ameliorating the condition of the sick and wounded in time of war. The credit of originating this conference must be given to two citizens of Geneva, Dunant, a physician, who published a startling account of what he had seen in two military hospitals on the field of Solferino, and his friend Moynier, chairman of the Geneva society of public utility, who took up the idea of "neutralizing the sick wagons," formed associations for its agitation, and at length pressed it upon the governments of Europe, most of which sent representatives to the conference. The convention was drawn up and signed by them on August 22d, and since then it has received the adherence of every European power, and one Asiatic (viz., Persia).

A second conference was held at Geneva on the same subject in 1868, and a supplementary convention drawn out, which, though not formally signed, has been acquiesced in by all the signatories of the original convention, except the pope, and which, while still unratified, was adopted provisionally by France and Germany in their war of 1870. It consists partly of interpretations of the former convention, and partly of an application of its principles to maritime wars.

GENEVIÈVE, or GENOVEFA, St., patroness of Paris, flourished during the latter half of the fifth century. She was born about 425 at Nanterre, near Paris, or according to another tradition at Montriére. Her death occurred in 500, or according to another account in 512, and her remains were ultimately laid in the chapel bearing her name, which has now become merged in the Pantheon or Église St. Geneviève.

GENGA, GIROLAMO, a painter and architect, was born at Urbino about 1476. He died in the same city in 1551.

GENGIS KHAN. See JENGHIZ KHAN.

GENLIS, STEPHANIE - FELICITE DUCREST DE SAINT AUBIN, COMTESSE DE, a voluminous French writer, was born of a noble but impoverished Burgundian family, at the Chateau de Champcercy, near Autun, on January 25, 1746. Her marriage with the Comte de Genlis, a colonel of grenadiers, who afterward became marquis of Sillery, took place in her sixteenth year, but was not suffered to interfere with a rapidly developing taste for acquiring and imparting knowledge. Some years later, through the influence of her aunt, Madame de Montesson, who had been clandestinely married to the Duke of Orleans, she entered the Palais Royal as lady-in-waiting to the duchess of Chartres (1770); and, after having acted with great energy and zeal as governess to the daughters of the family, she was in 1781 appointed by the duke to the responsible office of "gouverneur" of his sons, a bold step which though it led to the resignation of all the tutors as well as to much social scandal, can hardly in fairness be held to have seriously prejudiced the intellectual interests at least of those committed to her charge. The better to carry out her theory of education she wrote several works for the use of her royal pupils, the best known of which are the *Théâtre*

d'Education (1779-80), a collection of short comedies for young people, and *Les Annales de la Vertu* (1781). When the revolution of 1789 occurred, Madame de Genlis showed herself not unfavorable to the movement, and is said to have had considerable influence on the conduct of the Duke of Orleans; but the fall of the Girondins in 1795 compelled her to take refuge in Switzerland along with her pupil, Mademoiselle d'Orleans. It was in this year that her husband, the marquis of Sillery, from whom she had been separated since 1782, perished on the scaffold. An "adopted" daughter, Pamela Berkley or Simms, had been married to Lord Edward Fitzgerald in the preceding December. In 1794 Madame de Genlis fixed her residence at Berlin, but having been expelled by the orders of King Frederick William, she afterward settled in Hamburg, where she supported herself for some years by writing and painting. After the revolution of the 18th Brumaire (1799) she was permitted to return to France, and was received with favor by Napoleon, who gave her apartments at the arsenal, and afterward assigned her a pension of 6,000 francs. During this period she wrote largely, and produced what is generally considered to be her best romance, entitled *Mademoiselle de Clermont*. At the Restoration she succeeded in adjusting herself once more to the new state of things, and continued to write with all her former diligence. Her later years were occupied largely with literary quarrels. Madame de Genlis before her death, which occurred on December 31, 1830, had the satisfaction of seeing her former pupil, Louis Philippe, seated on the throne of France.

GENOA, in literary Italian *Genova*, in the local dialect *Zene*, in Latin and German *Genua*, in mediæval Latin *Ianua*, and in French *Gênes*, one of the most important cities of Italy, is situated in what was formerly known as Liguria, on the northern coast of the Mediterranean near the middle of the Gulf of Genoa. The city, as seen from the sea, is "built nobly," and deserves the title it has acquired or assumed of the Superb. The present line of circumvallation dates from 1626-32, the period when the independence of Genoa was threatened by the dukes of Savoy. There are eight gates in all—the more important being Porta Pila and Porta Romana toward the east, and the new Porta Lanterna or Lighthouse Gate to the west. Genoa claims the distinction of being the birthplace of Christopher Columbus.

GENOVA, LUCETTO DA. This is the familiar name given to the painter Luca Cambiasi (written also Cambiaso or Cangiagio), who was born at Moneglia, in the Genoese state, in 1527, and died in 1585.

GENOVESI, ANTONIO, an Italian writer on philosophy and political economy, was born in November, 1712, at Castiglione, near Salerno. He died in 1769.

GENSERIC, or GENSERICH, king of the Vandals, and the most formidable of the Gothic invaders of the Roman empire, was the natural son of Godegiselus, the founder of a Vandal kingdom in Spain, and was born at Seville about 406. In 435 Genseric concluded a treaty with the Romans by which he retained possession of western Numidia and Mauretania; but peace was not of long duration, and in October, 439, he captured Carthage, which he made the capital of his kingdom. Genseric was an Arian, and cruelly persecuted the orthodox Catholics in Africa. In 455 at the invitation of Eudocia, who wished to be revenged on Maximus, the murderer of her husband Valentinian, he fitted out an expedition against Rome, and after storming the city, gave it up during fourteen days to be pillaged by his soldiers. Eudocia and her daughters he carried captive to Carthage, where she was retained in prison till 462. Two attempts were

made by the Romans to avenge themselves on the barbarians,—the first by Majorian, emperor of the West, in 457, and the second by Leo, emperor of the East, in 468. Both attempts, however, signally failed, and in 475 Leo's successor Zeno concluded a truce. Genseric's dominion ultimately included Sicily, Sardinia, Corsica, and the Balearic isles; and he even extended his conquests to Thrace, Egypt, and Asia Minor. He died in 477.

GENTIAN, botanically *Gentiana*, a large and typical genus of herbaceous plants forming the type of the natural order *Gentianaceae*. The genus comprises about 180 species—most of them perennial plants growing in hilly or mountainous districts, chiefly in the northern hemisphere, some of the blue-flowered species ascending to the height of 16,000 feet in the Himalaya mountains. Gentian is considered by therapeutists to be one of the most efficient of the simple bitter tonics, that is, of that class of substances which act upon the stomach so as to invigorate digestion and thereby increase the general nutrition, without exerting any direct influence upon any other portion of the body than the alimentary canal. It is used in dyspepsia, chlorosis, anemia, and various other diseases, in which the tone of the stomach and alimentary canal is deficient, and is sometimes added to purgative medicines to increase and improve their action. In veterinary medicine it is also used as a tonic, and enters into a well-known compound called *diapente* as a chief ingredient.

GENTILESCHI, **ARTEMISIA** and **ORAZIO DE'**, painters. **ORAZIO** is generally named **Orazio Lomi de' Gentileschi**; it appears that De' Gentileschi was his correct surname, Lomi being the surname which his mother had borne during her first marriage. He was born at Pisa in 1565. His works generally are strong in shadow and positive in color. He died in England in 1646. **ARTEMISIA**, Orazio's daughter, was born in 1590. Studied first under Guido, acquired much renown for portrait-painting, and considerably excelled her father's fame. She was a beautiful and elegant woman. Her most celebrated composition is Judith and Holofernes, in the Pitti palace. She accompanied her father to England, but did not remain there long. She settled in Naples, whither she returned after her English sojourn; she lived there in no little splendor, and there she died in 1642.

GENTILI, **ALBERICO**, may fairly be called the founder of the science of international law. He was born January 14, 1552, at Sanginesio, a small town of the march of Ancona. After taking the degree of doctor of law at the university of Perugia, and holding a judicial office at Ascoli, he set out for England. He arrived at Oxford in the autumn of 1580, with a commendatory letter from the earl of Leicester, at that time chancellor of the university, and was shortly afterward qualified to teach by being admitted to the same degree which he had taken at Perugia. His lectures on Roman law soon became famous. In 1584 he was consulted by government as to the proper course to be pursued with Mendoza, the Spanish ambassador, who had been detected in plotting against Elizabeth. In 1588 Alberico selected the law of war as the subject of the law disputations at the annual "Act" which took place in July. In 1600 he was admitted to be a member of Gray's Inn, and in 1605 was appointed standing counsel to the king of Spain. He died June 10, 1608.

GENTILLY, a town of France, in the department of the Seine, is situated on the Bièvre, a short distance south of the fortifications of Paris.

GENTZ, **FRIEDRICH VON**, born at Breslau, May 2, 1764, aptly and accurately described by his distinguished friend Varnhagen von Ense as a writer-statesman. He was more than a publicist or political writer.

His position was peculiar, and his career without a parallel. He broke ground in literature in 1794, by a translation of the celebrated *Essay on the French Revolution*, followed in 1794 and 1795 by translations from Mallet du Pan and Mounier. In 1795 he founded and edited a monthly journal which soon came to an untimely end. In November, 1797, he published a pamphlet under the title of a *Sendschreiben* or *Missive* addressed to Frederick William III. of Prussia on his accession, pointing out the duties of the new sovereign and especially recommending the complete freedom of the press. In the course of the next three years he contributed to the *Historisches Journal* a series of articles "On the Origin and Character of the War against the French Revolution," with express reference to Great Britain. These led to his visiting England, where he formed intimate relations with Mackintosh, Lord Grenville, Pitt and other eminent men, which proved lasting, flattering, and remunerative. He was first secretary to the congress of Vienna in 1814, where, besides his regular duties, he seems to have made himself useful to several of the plenipotentiaries, as he notes in his diary that he received 22,000 florins in the name of Louis XVIII. from Talleyrand, and £600 from Lord Castlereagh, accompanied by "*les plus folles promesses*," and acted in the same capacity at the congress or conference of Paris in 1815, of Aix in 1818, Karlsbad and Vienna in 1819, Troppau and Laybach in 1820 and 1821, and Verona in 1822. When sixty-seven years old he became infatuated with Fanny Elskler, the dancer. He died June 9, 1832.

GENUS (Lat. a kind), in Natural History, a group of species, closely connected by common characters or natural affinity. In all branches of zoology and botany, the name of the genus forms the first part of the scientific name of each species, and is followed by a second word—either an adjective or substantive—which distinguishes the particular species. Thus, in *solanum tuberosum* (the potato), *Solanum* is the generic, and *tuberosum* the specific (sometimes styled the *trivial*) name.

GEOCENTRIC means having the earth for center; thus the moon's motions are geocentric. The geocentric latitude of a planet is the inclination to the plane of the ecliptic of a line connecting it and the earth; the geocentric longitude being the distance measured on the ecliptic from the first point of Aries to the point in the ecliptic to which the planet as seen from the earth is referred.

GEODES (Gr. earthy) are rounded, hollow concretions, or indurated nodules, either empty or containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals.

GEODESY (γῆ, Ge, the earth; δαίω, daïō, I divide,) is the science of surveying extended to large tracts of country, having in view not only the production of a system of maps of very great accuracy, but the determination of the curvature of the surface of the earth, and eventually of the figure and dimensions of the earth. This last, indeed, may be the sole object in view, as was the case in the operations conducted in Peru and in Lapland by the celebrated French astronomers Bouguer, La Condamine, Maupertuis, Clairaut, and others.

The basis of every extensive survey is an accurate triangulation, and the operations of geodesy consist in—the measurement, by theodolites, of the angles of the triangles; the measurement of one or more sides of these triangles on the ground; the determination by astronomical observations of the azimuth of the whole network of triangles; the determination of the actual position of the same on the surface of the earth by observations, first for latitude at some of the stations, and secondly for longitude.

To determine by actual measurement on the ground the length of a side of one of the triangles, wherefrom to infer the lengths of all the other sides in the triangulation, is not the least difficult operation of a trigonometrical survey. When the problem is stated thus—To determine the number of times that a certain standard or unit of length is contained between two finely marked points on the surface of the earth at a distance of some miles asunder, so that the error of the result may be pronounced to lie between certain very narrow limits—then the question demands very serious consideration. The representation of the unit of length by means of the distance between two fine lines on the surface of a bar of metal at a certain temperature is never itself free from uncertainty and probable error, owing to the difficulty of knowing at any moment the precise temperature of the bar; and the transference of this unit, or a multiple of it, to a measuring bar, will be affected not only with errors of observation, but with errors arising from uncertainty of temperature of both bars. If the measuring bar be not self-compensating for temperature, its expansion must be determined by very careful experiments. The thermometers required for this purpose must be very carefully studied, and their errors of division and index error determined.

Various geodetic surveys have been made from time to time by different governments, for different purposes, and in widely different countries and climates. The most noteworthy are the United States coast survey and the French survey in Algiers for the purpose of determining the true length of the distance from the equator to the north pole along the arc of the meridian in order to furnish an invariable and uniform standard of measurement, which was finally fixed at 10000000 of this distance, or the French meter.

The instruments used in these experiments are too complex and numerous to be described here, and for an account of them the reader is referred to any standard work on the higher branches of trigonometry, engineering and applied mathematics.

GEOFFREY OF MONMOUTH (1102?-1154), one of the most famous of the Latin chroniclers, was born at Monmouth early in the twelfth century. Very little is known of his life. He became archdeacon of the church in Monmouth, and in 1152 was elected bishop of St. Asaph. He died in 1154. Three works have been attributed to him—the *Chronicon sive Historia Britonum*; a metrical *Life and Prophecies of Merlin*; and the *Compendium Gaufridi de Corpore Christi et Sacramento Eucharistie*.

GEOFFROY SAINT-HILAIRE, ÉTIENNE, a celebrated French naturalist, was the son of Jean Gérard Geoffroy, procurator and magistrate of Étampes, Seine-et-Oise, where he was born, April 15, 1772. Destined by his friends for the church, he entered, as an exhibitor, the college of Navarre, in Paris. Science, however, offered to him a career more congenial to his tastes than that of an ecclesiastic, and, after some persuasion, he gained from his father permission to remain in Paris, and to attend the lectures at the Collège de France and the Jardin des Plantes, on the condition that he should likewise read law. Having, before the close of the year 1790, taken the degree of bachelor of law, he became a student of medicine, but the lectures of Fourcroy at the Jardin des Plantes, and of Daubenton at the Collège de France, and his favorite scientific pursuits gradually came to occupy his almost exclusive attention. His studies at Paris were at length suddenly interrupted, for, on August 12 or 13, 1792, Haiiy and the other professors of Lemoine's college, as also those of the college of Navarre, were arrested by the revolutionists as priests, and confined in the prison of St.

Firmin. At the beginning of the winter of 1792 he returned to his studies in Paris, and in March of the following year Daubenton, through the interest of Bernardin de Saint Pierre, procured him the office of sub-keeper and assistant demonstrator of the cabinet of natural history, vacant by the resignation of Lacépède. By a law passed June 10, 1793, Geoffroy was appointed one of the twelve professors of the newly constituted museum of natural history, being assigned the chair of zoology.

In 1798 Geoffroy was chosen a member of the great scientific expedition to Egypt. With Delile and Larrey, on the capitulation of Alexandria, in August, 1801, he resisted the claim made by the British general Hutchinson to the collections of the expedition, sending him word that, were his demands persisted in, history would have to record of him that he also had burnt a library in Alexandria. Early in January, 1802, Geoffroy returned to his accustomed labors in Paris. He was elected a member of the academy of sciences of that city in September, 1807. In March of the following year the emperor, who had already recognized his national services by the award of the cross of the Legion of Honor, selected him to visit the museums of Portugal, for the purpose of procuring from them collections, and these, though in the face of considerable opposition from the British, he eventually was successful in retaining as a permanent possession for his country. In 1809, the year after his return to France, he was made professor of zoology of the faculty of sciences at Paris, and from that period he devoted himself more exclusively than before to the study of anatomical philosophy. In 1815 he was elected political representative for his native town. Three years later he gave to the world the first part of his celebrated *Philosophie Anatomique*, the second volume of which, published in 1822, and memoirs subsequently written, account for the formation of monstrosities on the principle of arrest of development, and of the attraction of similar parts. In July, 1840, Geoffroy became blind, and some months later he had a paralytic attack. From that time his strength gradually failed him. He resigned his chair at the museum in 1841, and, on June 19, 1844, at the age of seventy-two, he died.

GEOFFROY SAINT-HILAIRE, ISIDORE, a French zoologist, son of the preceding, was born at the Jardin des Plantes, Paris, December 16, 1805. In his earlier years he showed an aptitude for mathematics, but eventually he devoted himself to the study of natural history and of medicine, and in 1824 he was appointed assistant naturalist to his father. He was elected a member of the academy of sciences at Paris, April 15, 1833; was, in 1837, appointed to act as deputy for his father at the faculty of sciences in Paris, and in the following year was sent to Bordeaux to organize a similar faculty there. He became successively inspector of the academy of Paris (1840), professor of the museum on the retirement of his father, inspector general of the university (1844), a member of the royal council for public instruction (1845), and, on the death of Blainville, professor of zoology at the faculty of sciences (1850). In 1854 he founded the Acclimatization Society of Paris, of which he was president. He died at Paris, November 10, 1861.

GEOGRAPHY is the science which describes the earth, the term being derived from two Greek words $\gamma\eta$ (Gē), the earth, and $\gamma\rho\acute{\alpha}\varphi\omega$ (graphō), I write. By means of geography the surface of the earth is delineated and described, boundaries are defined, areas are exactly measured, and the relative positions of places are determined. Geography thus embraces a wide range of subjects, and it has been found necessary to divide its study into several distinct sections.

I. Comparative Geography traces the history of discovery, and records the changes which have taken place in land and sea in historic times.

II. Mathematical Geography explains the figure, magnitude, and motion of the earth, teaches how to determine the positions of places on its surface, and shows how the whole or any portion of the earth may, on the principles of projection, be delineated on a map or chart.

III. Physical Geography is the description of the actual state of the earth's surface in its three great divisions—land, sea, and air.

IV. Political Geography describes the earth as divided into countries, occupied by various nations, and improved by human art and industry.

VIEW OF THE PROGRESS OF GEOGRAPHICAL DISCOVERY.

Four main causes have led to geographical discovery and exploration, namely, commercial intercourse between different countries, the operations of war, pilgrimages and missionary zeal, and in later times the pursuit of knowledge for its own sake, which is the highest of all motives.

The Phœnicians are the earliest commercial people of whose discoveries we have any correct accounts. They first explored the shores of the Mediterranean, and eventually extended their voyages through the Straits of Gibraltar, and visited the western shores of Spain and Africa, planting colonies and opening wider fields for their commerce by instructing the natives in their arts and improvements. They also monopolized the trade with India; and their chief emporium, the rich city of Tyre, was the center whence the products of the east and west were distributed.

The great Phœnician colony of Carthage retained in full vigor the commercial spirit of the parent state. The Carthaginians traded on the coasts of Spain and Gaul, and extended their discoveries southward along the coast of Africa, and to the Fortunate Islands, now known as the Canaries.

The conquests of Alexander the Great, by making known the vast empire of Persia, materially enlarged the bounds of geographical knowledge. Although the course of his expedition was mainly by land, the mind of the conqueror was also intent on commerce and maritime discovery. In 327 B.C. Alexander led an army of Greeks down the valley of the Cabul river into the Punjab, and his expedition resulted in a voyage of discovery from the mouth of the Indus to that of the Tigris, and in opening direct intercourse between Grecian and Hindu civilization.

The dynasties founded by Alexander's generals, Seleucus, Antiochus, and Ptolemy, encouraged the same spirit of enterprise which their master had so carefully fostered, and extended geographical knowledge in several directions.

The Ptolemies of Egypt showed equal anxiety to extend the bounds of geographical knowledge.

The Romans did not encourage navigation and commerce with the same ardor as their predecessors; still the luxury of Rome, which gave rise to demands for the varied products of all the countries of the known world, led to an active trade both by ships and caravans. But it was the military genius of Rome, and the ambition for universal empire, which led not only to the discovery, but also to the survey of nearly all Europe, and of large tracts in Asia and Africa.

In all time, while warriors and explorers extended the area of geographical knowledge, there have been students who have striven to systematize and put into due form the accumulated information. From the first it

was perceived that a knowledge of localities could not be attained without some notion of their relative positions, and their distances from each other. Consequently the attempts to establish fixed principles on which the surface of the earth, or any portion of it, could be delineated, were almost coeval with the earliest voyages of discovery.

The first attempt made to determine the position of places appears to have depended on the division of the earth into "climates," distinguished by the species of animals and plants produced in each. This method, however, was soon abandoned for another, which consisted in observing at places the length of the longest and shortest days by means of a "gnomon." An upright pillar of a known height being erected on a level pavement, by observing the lengths of the meridian shadows the progress of the sun from tropic to tropic was traced. The most ancient observation with the gnomon is that of Pythias, in the days of Alexander the Great, who observed at the summer solstice at Massilia that the length of the meridian shadow was to the height of the gnomon as $213\frac{1}{4}$ to 600, an observation which makes the meridian altitude of the sun at Marseilles on that day $70^{\circ} 27'$. The merit of the invention of the gnomon in Greece is ascribed to the astronomical school of Miletus; but there is reason to believe that this method of observation was invented in Egypt, and that Thales carried the knowledge of it into Greece. This was the first step toward connecting geography with astronomy; and little further advance was made until the establishment of the famous astronomical school of Alexandria.

Eratosthenes (276–196 B.C.) was the first who reduced geography to a regular system, and laid its foundations on clear and solid principles.

The improvements introduced by Eratosthenes were perfected in principle by Hipparchus, who flourished from 160 to 135 B.C. He was the first astronomer who undertook the arduous task of making a catalogue of the stars and fixing their relative positions.

The most ancient maps that have reached modern times are those which illustrate Ptolemy's geography, but an earlier map made for Aristagoras, king of Miletus (500 B.C.), is minutely described by Herodotus. Ptolemy composed his system of geography in the reign of Antoninus Pius, about 150 A.D.

Although Ptolemy was the first scientific geographer whose work has come down to us in a complete form, the earlier labors of Strabo, who lived in the reigns of Augustus and Tiberius, are of equal value, and we fortunately possess the whole of his seventeen books. Pliny also devoted two books of his extensive work to geography; and the scattered geographical notices of other ancient writers were collected into one work of four volumes by Hudson, and published between 1698 and 1712, with notes by Dodwell. From the days of Ptolemy to the revival of letters in Europe, little was done toward the scientific improvement of geographical science, though military and commercial enterprise led to a great extension of knowledge of the earth's surface.

The emperor Justinian sent two Nestorian monks to China, who returned with eggs of the silkworm concealed in a hollow cane, and thus silk manufactures were established in the Peloponnese and the Greek Islands. It was also in the reign of Justinian that Cosmos Indicopleustes, an Egyptian merchant, made several voyages, and afterward composed his *Topographia Christiana*, containing a particular description of India. The great outburst of Mahometan conquest was followed by an Arabian civilization, having its centers at Cordova and Baghdad, in connection with which geography again received a share of attention.

From the ninth to the thirteenth century intelligent Mahometan travelers wrote accounts of what they had seen and heard in distant lands, which have been handed down to us; while the caliphs of Baghdad encouraged the study of geographical science.

The earliest Arabian traveler whose observations have come down to us is the merchant Suleiman, who embarked in the Persian Gulf and made several voyages to India and China in the middle of the ninth century. Suleiman's information was supplemented by that collected by another writer named Abu Zaid; and, so far as India is concerned, this work is the most important that we possess before the grand epoch of the discoveries of Marco Polo.

The Mongol and Turkish dynasties, which succeeded each other after the fall of the Arabian caliphs, also produced rulers who encouraged geographical science. Philosophers assembled at the court of Hulaku Khan (1253-1264) at Maraghal in the north of Persia; and his friend Nâsir-ud-Din was the most famous astronomer of the age.

The Northmen of Denmark and Norway, who were the terror of all the coasts of Europe, and who established themselves in England and Ireland, in France and Sicily, were also great promoters of geographical discovery during the darkest period of the Middle Ages. The Northmen were far from being always vikings, bent only on rapine and plunder. They were very often peaceful merchants.

In the end of the ninth century Iceland was colonized from Norway; and in 985 the intrepid viking Erik surnamed the Red discovered Greenland, and induced some of his Icelandic countrymen to settle on its inhospitable shores. In 986 young Bjorn, son of one of Erik's comrades, sailed from Iceland to join his father in Greenland, but shaped his course too far to the south, and was the discoverer of America. He sailed along the coasts of Connecticut, Massachusetts, and Nova Scotia, before he eventually found the fjord on the Greenland coast where his father dwelt. Then Leif, the son of Erik, bought the ship from young Bjorn and made another voyage of discovery, and once more the coast of America was visited. Other expeditions were undertaken by his two brothers, intercourse was kept up between Greenland and Norway, and the *saga* of Thorfinn tells us of other voyages to America. The last that was heard of the Norwegian colonies in Greenland was in a brief of Pope Nicolas V. in 1448, where it is stated that, thirty years before, the settlements had been destroyed by the attacks of savages.

At length the long period of barbarism which accompanied and followed the fall of the Roman empire drew to a close in Europe. The crusades had a very favorable influence on the intellectual state of the Western nations. Interesting regions, known only by the scant reports of pilgrims, were made the objects of attention and research; while religious zeal, and the hope of gain, combined with motives of mere curiosity, induced several persons to travel by land into remote regions of the East, far beyond the countries to which the operations of the crusaders extended. Among these was Benjamin of Tudela, who set out from Spain in 1160, traveled by land to Constantinople, and having visited India and some of the eastern islands, returned to Europe by way of Egypt, after an absence of thirteen years.

Christian missionary zeal was another motive for exploration. John of Plano Carpini, in Perugia, a Franciscan monk, was the head of one of the missions dispatched by Pope Innocent to call the chief and people of the Tartars to a better mind. He reached the headquarters of Batu, on the Volga, in February, 1246; and, after some stay, went on to the camp of the great

khan near Karakorum, and returned safely in the autumn of 1247. A few years afterward, a Fleming named Rubruquis was sent by St. Louis on a mission to the Tartar chiefs, and wrote a very interesting narrative.

Nicolo and Maffeo Polo, two brothers who traded with the East, visited Tartary. The recital of their travels fired the youthful imagination of young Marco Polo, the son of Nicolo, and he set out for the court of Kublai Khan, with his father and uncle, in 1265. After a journey of three years and a half they reached Yeu-king, near the spot where Peking now stands, and young Marco was enrolled among the attendants of honor of the Grand Khan. The work of Marco Polo is the most valuable narrative of travels that appeared during the Middle Ages, and its latest and ablest editor truly says, "All other travelers of that time are but stars of a low magnitude beside the full orb of Marco Polo."

Still these minor orbs continued to do useful geographical work, while striving to spread the doctrines of the Gospel.

Ibn Batuta, the great Arab traveler, is separated by a wide space of time from his countrymen already mentioned, and he finds his proper place in a chronological notice after the days of Marco Polo—for he was not born at Tangier until 1304. He began his wanderings in 1325, his career thus coinciding in time with that of Sir John Mandeville (1322-1356), but the Moor was more trustworthily than the Englishman. Ibn Batuta went by land from Tangier to Cairo, then visiting Syria, and performing the pilgrimages to Medina and Mecca. After exploring Persia, and again residing for some time at Mecca, he made a voyage down the Red Sea to Yemen, and traveled through that country to Aden, which remarkable place he correctly describes. Thence he visited the African coast, touching at Mombas and Quiloa, and then sailed across to Ormuz and the Persian Gulf. He crossed Arabia from Bahrein to Jiddah, traversed the Red Sea and the desert to Syene, and descended the Nile to Cairo. After this he revisited Syria and Asia Minor, crossed the Black Sea to Caffa, and proceeded to the camp of the khan of Kipchak at the foot of the Caucasus. Ibn Batuta crossed the desert from Astrakhan to Bokhara, and went over the Hindu Kush to Cabul, reaching the Indus somewhere below Larkhana, in 1333. He was sent on an embassy to China in 1342, traveling by land from Delhi to the seaport; whence the ambassadors sailed down the west coast of India to Calicut, and then visited the Maldiv Islands and Ceylon. He made a voyage through the islands to China, and on his return he proceeded from Malabar to Baghdad and Damascus, where he got his first news from home and heard of his father's death. Finally he reached Fez, the capital of his native country, in November, 1349, after an absence of twenty-four years, and came to the conclusion that there was no place like home. After a journey into Spain, he set out for Central Africa in 1352, and reached Timbuctoo and the Niger, returning to Fez in 1353. He had traveled over a length of at least 75,000 English miles. His narrative was committed to writing from his dictation, by order of the sultan of Fez, and the work was completed in December, 1355. Ibn Batuta died at the age of seventy-three, in the year 1377.

The peaceful reign of Henry III. of Castile is famous for the attempts of that prince to extend the diplomatic relations of Spain to the remotest parts of the earth. Mariana tells us that he sent embassies to the princes of Christendom and to the Moors. In 1403 the Spanish king sent a knight of Madrid, named Ruy Gonzalez de Clavijo, to the court of the mighty Timur, at Samarkand. He returned in 1406, and died soon after, but not before he had written a most valuable and interest-

ing narrative of his travels from Constantinople through Persia and Khorasan to the Oxus, and thence by the Iron Gates to Samarkand.

Several Italians continued to make important journeys in the East during the fifteenth century. One of the most remarkable of the Italian travelers was Ludovico di Varthema, whose insatiable desire to see foreign countries induced him to leave his native land in the year 1502.

In mentioning Varthema we have anticipated events; but in the fifteenth century the time was approaching when the discovery of the Cape of Good Hope was almost indefinitely to widen the scope of geographical enterprise. The great event was preceded by the discovery of the polarity of the magnetic needle, and the consequent construction of the mariner's compass. This most important discovery appears to have been made in China, and it is uncertain when the compass was first used by Western nations. Its introduction has been attributed to Flavio Gioia, a citizen of Amalfi, in the kingdom of Naples, about the year 1307. Navigation was then destined to make rapid progress. The growing spirit of enterprise, combined with the increasing light of science, prepared the states of Europe for entering upon that great career of discovery, of which the details constitute the materials for the history of modern geography. Portugal took the lead in this new and brilliant path, and foremost in the front rank of the worthies of this little hero-nation stands the figure of Prince Henry the Navigator.

Having acquired military renown by the capture of Ceuta in 1415, he set his mind upon the conquest of Guinea, and sent every year two or three vessels to examine the coasts beyond Cape Nun, which was then the limit of exploration. Yet none of his ships for many years had the hardihood to round Cape Bojador.

The first fruit of Prince Henry's explorations was the re-discovery of Madeira and Porto Santo, in 1418 and 1420. In 1433 one of the prince's ships, commanded by Gil Eannes, at length doubled Cape Bojador. In 1435 Affonso Gonsalves Baldaya, the prince's cup-bearer, passed fifty leagues beyond the cape; and eight years afterward Nuño Tristam got to a point twenty-five miles beyond Cape Blanco. But it was not until 1445 that the mouth of the Senegal was reached by Diniz Dias; and in those days the Portuguese gave the name of Guinea to the country commencing at Cape Nun. In 1481 the king of Portugal assumed the title of lord of Guinea. Up to 1446 there had been fifty-one caravels to the Guinea coast, and almost every year some new advance was made. Meanwhile the Canaries and Azores were brought within the realms of Spain and Portugal. In 1402 a Norman named Jean de Bethencourt, accompanied by Gadifer de la Salle, had landed on the island of Langarote, and with reinforcements from Spain he subjugated Fortaventura and Ferro, and received the sovereignty of the Canaries from the king of Castile. But he returned to his lands in Normandy in 1406, and died there in 1425. Gomera, Palma, Tenerife and the Great Canary were still unconquered. Prince Henry made several attempts to establish Portuguese rule on these islands; the right was long disputed with Spain; and it was not until 1479 that the treaty of Alcaçora provided for the concession of the sovereignty of the Canaries to Spain. Prince Henry, however, successfully colonized the Azores, and in 1444 St. Michael's was discovered, the settlement of the other islands following soon afterward.

In 1455 an important expedition was dispatched by Prince Henry, under the command of a young Venetian adventurer named Alvise Cadamosto. Touching at

Madeira and the Canaries, Cadamosto made his way to Cape Blanco on the African coast, and thence to Senegal and the Gambia. He returned with a full report of all he had seen, and in the following year he again sailed from Lagos direct for Cape Blanco, with three ships, and discovered the mouth of a river which he named the Rio Grande (Jeba?). In 1457 Diogo Gomez sailed with orders to proceed as far as he could, and made his way to the Gambia. The Cape Verd Islands were discovered and colonized about 1462.

The progress of discovery for a time received a check from the death of Prince Henry, but only for a time. The results westward and eastward of the exertions of Prince Henry were the discovery of America by Columbus and of the Cape route to India by Vasco da Gama.

Christopher Columbus was born at Genoa about 1435. By 1474 his grand project of discovery was established in his mind, and nothing afterward could divert him from the pursuit of it. On the refusal of the king of Portugal to entertain his proposal, Columbus left Lisbon with his son in 1484, and he spent the interval until 1492 in appeals to the Spanish court. At length, having overcome all obstacles, he set sail with a fleet of three ships from Palos, on August 3, 1492, on his unprecedented and perilous voyage. On October 12th, having crossed the Atlantic, Columbus sighted land, which was named San Salvador. After discovering Cuba, Hispaniola, and many small islands, Columbus set sail on his return voyage on January 16, 1493, and arrived at Palos, on March 15th. His reception in Spain was enthusiastic, and commensurate with the grandeur of his achievement; and on September 25, 1493, he sailed from Cadiz on his second voyage, with a fleet of three large ships and fourteen caravels. On November 3d he discovered the island of Dominica, and during the voyage his discoveries included the Windward Islands and Jamaica. He returned to Cadiz on June 11, 1496; and it was not until May 30, 1498, that he set sail on his third voyage. The first land he came to formed a new discovery, which he named the island of Trinidad, and it was in this voyage that he reached the mainland of South America, and discovered the islands of Cubagua and Margarita. On May 9, 1502, Columbus was allowed to sail on a fourth and last voyage of discovery. He reached the island of Martinique on June 13th, and touched at Dominica and Hispaniola. Thence he sailed westward, discovering the coast of Veragua and the harbor of Porto Belle. After a stay in Jamaica, he set sail for Spain on September 12, 1504, and arrived at San Lucar on November 7th. He lived two years longer, experiencing the slackest ingratitude from the Spanish court. At length, in debt and poverty, and bowed down by disappointment, this great man died May 20, 1506. His body was buried at Valladolid, and removed in 1513, to Cartuja de las Cuevas near Seville.

While Columbus was discovering a new world, the Portuguese continued their persevering efforts to reach India by sea. Vasco da Gama sailed from Lisbon on July 8, 1497, with four vessels built expressly for the voyage, the largest not exceeding 120 tons, and called the *Sam Gabriel*. His brother Paolo commanded the *Sam Raphael*, and the *Berrio* was under Nicolas Coelho. On November 22d, with a fair wind, Da Gama rounded the Cape of Good Hope, and anchored in the bay named San Bras by Bartholomeu Dias, on the 25th. On Christmas Day he sighted land, which, on that account, he named Natal. He reached Mombas on April 7th, and on May 20, 1498, he anchored before Calicut. Da Gama returned to Lisbon in August, 1499; and at his recommendation another fleet was fitted out, consisting of thirteen

well-armed ships, under Pedro Alvarez Cabral, with Bartholomeu Dias and Nicolas Coelho under his orders. The expedition sailed on March 9, 1500; and on April 22d, Cabral discovered the coast of Brazil, and took formal possession for the king of Portugal. Resuming his voyage to the east, he reached Calicut in September, and obtained permission to build a factory, establishing friendly relations also at Cananor and Cochín. He returned to Lisbon in July, 1501. Vasco da Gama set sail, with a much larger fleet, on his second voyage in 1502. He visited several ports on the west coast of India, engaged in war as well as in commerce, and returned in September, 1503. In 1503 Antonio da Saldanha and Affonso de Albuquerque sailed for India, and made terms of friendship with the chief of Quilon. Dom Francisco de Almeida, the first viceroy of the Indies, was sent out in 1505. He founded the ports of the Angediva and Cananor, and his son Laurenceo discovered Ceylon. Tristam da Cunha, with Affonso de Albuquerque under his orders, was sent to occupy Socotra, and in 1506 Albuquerque came to India as second viceroy. He explored the coasts of Arabia and Persia, made the king of Ormus tributary to Portugal, and sent embassies to Abyssinia. In 1509 (?) a factory was established at Malacca; and on November 25, 1510, the great Albuquerque conquered Goa, and established the seat of his government there. In 1512 the Moluccas were discovered; and in 1517 Fernam Peres de Andrade reached China, and entered into commercial relations with the governor of Canton. In 1524 Vasco da Gama arrived in India for a third time, as viceroy, and landed at Goa on September 11th. He died at Cochín on December 24, 1524, and in 1538 his body was transported to Portugal, and buried in his tomb at Vidigueira, of which town he was count.

The achievements of Columbus and Da Gama are immeasurably enhanced when we consider the inadequate means at their disposal, their small and ill-formed ships, and their defective knowledge of navigation. The mariner's compass had been in use for nearly two centuries, and it was Columbus himself who first observed the phenomena of variation. But the compass and rough sea-card were the only appliances, until the learned Nuremberger, Martin Behaim, invented the application of the astrolabe to purposes of navigation, which enabled mariners to ascertain their latitude. This was in the year 1480.

The discoveries of Columbus awakened a spirit of enterprise in Spain which continued in full force for a century; adventurers flocked eagerly across the Atlantic, and discovery followed discovery in rapid succession. The first map known to exist with America delineated upon it is that drawn by Juan de la Cosa, the pilot of Columbus, in his second voyage, which dated 1500.

In 1508 Ojeda obtained the government of the coast of South America from Cabo de la Vela to the Gulf of Darien; and at the same time Diego Nicuesa was appointed governor of Veragua from the Gulf of Darien to Cape Gracias a Dios. In the year 1519 Panama was founded by Pedrarias; and the conquest of Peru by Pizarro followed a few years afterward. Hernan Cortes overran and conquered Mexico from 1518 to 1521, and the discovery and conquest of Guatemala by Alvarado, of Florida by Hernando de Soto, and of Nueva Granada by Quesada, followed in rapid succession. The first detailed account of the west coast of South America was written by that keenly-observant old soldier, Pedro de Cieza de Leon, who was traveling in South America from 1533 to 1550, and published his story at Seville in 1553.

But the great anxiety of the Spanish Government at that time was to find a westward route to the Moluccas.

For this purpose Juan Diaz de Solis was dispatched in October, 1515, and in January, 1516, he discovered the mouth of the Rio de la Plata. He was, however, killed by the natives, and his ships returned. In the following year Magellan laid before Charles V., at Valladolid, a scheme for reaching the Spice Islands by sailing westward. With a fleet of five ships, and the rank of captain-general, Magellan sailed from San Lucas on September 21, 1519. After touching on the coast of Brazil, at the Rio de la Plata, and at the ports on the east coast of Patagonia, Magellan entered the straits which bear his name in October, 1520. The fleet emerged from the strait and entered the Pacific Ocean on November 27, 1520. They then steered northwest, crossed the line on February 13, 1521, and on March 6th reached the Ladrone Islands. Thence Magellan proceeded to the Philippines. He was killed in an attack on the island of Matan, which he made in order to bring it under subjection to his ally the king of Zebu, on April 26, 1521.

While the Spaniards were circumnavigating the world and completing their knowledge of the coasts of Central and South America, the Portuguese were actively engaged on similar work as regards Africa and the East Indies. In the East Indies the Portuguese acquired predominating influence at sea, establishing factories on the Malabar coast, in the Persian Gulf at Malacca, and in the Spice Islands, and extending their commercial enterprises from the Red Sea to China.

English enterprise was first aroused by John and Sebastian Cabot, father and son, who came from Venice and settled at Bristol in the time of Henry VII. The Cabots received a patent, dated March 5, 1496, empowering them to seek unknown lands; and John Cabot discovered Newfoundland and part of the coast of America. Sebastian afterward made a voyage to Rio de la Plata in the service of Spain, but he returned to England in 1548, and received a pension from Edward VI.

The French followed closely on the track of John Cabot, and the hardy Norman and Breton seamen frequented the banks of Newfoundland at the commencement of the sixteenth century. In 1524 Francis I. sent Giovanni da Verazzano of Florence on an expedition of discovery to the coast of North America; and the details of his voyage were embodied in a letter addressed by him to the king of France from Dieppe, in July, 1524. On April 20, 1534, Jacques Cartier sailed from St. Malo with two vessels of sixty tons each, for the purpose of continuing the discoveries of Verazzano, and he visited Newfoundland and the Gulf of St. Lawrence. In the following year he made another voyage, discovered the island of Anticosta, and ascended the St. Lawrence to a place called Hochelaga, now Montreal. He returned, after passing two winters in Canada; and on another occasion he also failed to establish a colony.

The reign of Elizabeth is famous for the gallant enterprises that were undertaken by sea and land to discover and bring to light the unknown parts of the earth. The great promoter and father of English geographical discovery was Richard Hakluyt, who was born near London in 1553. He was the chief promoter in the formation of the two companies for colonizing Virginia in 1606; and he devoted his life to the encouragement of similar undertakings, and to their record.

The Dutch emulated the English in the Arctic seas during this period. Their merchants opened a trade with Kola and Archangel as early as 1578, but the difficulty of penetrating into the Sea of Kara led them to try the possibility of finding a passage round the northern end of Novaya Zemlya. The credit of the conception of this voyage is due to the great cosmog-

rapher Peter Plancius, and the merchants of Amsterdam adopted the idea, and dispatched a vessel of 100 tons called the *Mercurius*, under the command of William Barents. He sailed from the Texel on June 4, 1594, and sighted Novaya Zemlya on July 4th. Sailing northward along the coast he rounded Cape Nassau and reached the edge of the ice. For many days he perseveringly sought for a passage through it. His third voyage was the most important. Heemskerck was the commander, Barents was pilot, and the mate, Gerrit de Veer, was the historian of the voyage. They sailed from Amsterdam on May 13, 1596. On June 19th, Spitzbergen was discovered, and the whole western coast and part of the northern examined.

In 1577 Francis Drake, who had previously served with Hawkins in the West Indies, undertook his celebrated voyage round the world. His fleet consisted of three ships and two pinnaces, which were broken up during the voyage. The ships were the *Pelican* of one hundred tons, on board of which Drake himself embarked, the *Elizabeth* of eighty, and the *Marigold* of thirty tons. After some stay at Port San Julian on the coast of Patagonia, the fleet entered the Straits of Magellan on August 20, 1578, when Drake changed the name of his ship to the *Golden Hind*. They reached the western entrance on September 6th, and soon afterward the *Marigold* parted company in a gale of wind, and was never heard of again, while the *Elizabeth* basely deserted her consort and returned to England. Drake, in the *Golden Hind*, continued the voyage alone. At first he was driven to the southernmost point of Tierra del Fuego, and thus discovered that there was a passage, though he did not round Cape Horn. He then proceeded northward along the west coast of America, touching at the island of Mocha off the Chilian coast, at Valparaiso, Coquimbo, Tarapaca, Arica, Callao, and Payta. Off Cape San Francisco, nearly on the equator, he captured a very rich Spanish treasure-ship called the *Cacafuego*; and it is right to observe that England was then at peace with Spain. Drake resolved to attempt the discovery of a passage from the Pacific to the Atlantic, and with this object he continued to shape a course northward along the American continent. On June 5, 1579, the *Golden Hind* reached her most northern point in 48°, when the attempt was abandoned, and Drake put into a harbor to refit, named Port Drake, which appears to have been the modern harbor of San Francisco, on the coast of California. The coast from the southern extremity of the Californian peninsula to Cape Mendocino was discovered by Juan Rodriguez Cabrillo and Francisco de Ulloa in 1539. Drake's discoveries extend from Cape Mendocino to 48° north.

Leaving California, Drake sailed across the Pacific and reached the Philippine Islands in October. He touched at Ternate and Java, and rounded the Cape of Good Hope on June 15, 1580. The *Golden Hind* anchored safely at Plymouth on September 26th, following. Drake was graciously received and knighted by the queen, and the *Golden Hind*, the first English ship that circumnavigated the globe, was preserved for many years at Deptford.

The exploring enterprise of the Spanish nation did not wane after the conquest of Peru and Mexico, and the acquisition of the vast empire of the Indies. It was rather spurred into renewed activity by the audacity of Sir John Hawkins in the West Indies, and by the appearance of Drake, Cavendish, and Richard Hawkins in the Pacific.

The Portuguese, in the early part of the seventeenth century (1578-1640), were under the dominion of Spain, and their enterprise was to some extent damped; but

their missionaries extended geographical knowledge in Africa.

But the attention of the Portuguese was mainly devoted to vain attempts to maintain their monopoly of the trade of India against the powerful rivalry of the English and Dutch. The English enterprises were persevering, continuous, and successful.

The Dutch nation, as soon as it was emancipated from Spanish tyranny, displayed an amount of enterprise which, for a long time, was fully equal to that of England. The memorable Arctic voyages of Barents were quickly followed by the establishment of a Dutch East India Company; and Holland, ousting the Portuguese, not only established factories on the mainland of India and in Japan, but acquired a preponderating influence throughout the Eastern Archipelago.

The Dutch were resolved to discover a passage into the Pacific to the south of Tierra del Fuego, the existence of which was ascertained by Sir Francis Drake. The vessels fitted out for this purpose were the *Eendracht* of 360 tons, commanded by Jacob le Maire, and the *Horn*, of 110 tons, under Jan Schouten. They sailed from the Texel on June 14, 1615, and by January 20, 1616, they were south of the entrance of Magellan's Straits. Passing through the strait of Le Maire they came to the southern extremity of Tierra del Fuego, which was named Cape Horn, in honor of the town of Horn in West Friesland, of which Schouten was a native. They passed the cape on January 31st, encountering the usual westerly winds. The great merit of this discovery of a second passage into the South Sea lies in the fact that it was not accidental or unforeseen, but was due to the sagacity of those who designed the voyage. On March 1st the Dutch fleet sighted the island of Juan Fernandez; and, having crossed the Pacific, the explorers sailed along the north coast of New Guinea, and arrived at the Moluccas on September 17, 1616. In 1623, the Dutch sent expeditions against Brazil and Peru, which, however, did little to advance geographical knowledge, except that the Brazilian invasion resulted in the valuable work of Nieuhof.

There were several early indications of the existence of the great Australian continent, which have been very ably discussed by Mr. Major; and the Hollanders endeavored to obtain further knowledge concerning the country and its extent; but only its northern and western coasts had been visited before the time of Governor Van Diemen. Dirk Hartog had been on the west coast in latitude 26° 30' south, in 1616. Pelsert struck on a reef called "Houtman's Abrolhos" on June 4, 1629. In 1697 the Dutch captain Vlamingh landed on the west coast of Australia in 31° 43' south, and named the Swan River, where he saw some black swans. In 1642 the governor and council of Batavia fitted out two ships to prosecute the discovery of the south land, and intrusted the command to Captain Abel Jansen Tasman. This voyage proved to be the most important to geography that had been undertaken since the first circumnavigation of the globe. Tasman sailed from Batavia in the yacht *Heemskirk* on August 14, 1642, and from Mauritius on October 8th. On November 24th high land was sighted in 42° 30' south, which was named Van Diemen's Land, and, after landing there, sail was again made, and New Zealand (at first called Staten Land) was discovered on December 14th. Tasman communicated with the natives and anchored in what he called Murderer's Bay. From New Zealand it was resolved to steer north and then eastward to longitude 140° E. On this course the ships arrived at Tongatabu, one of the Friendly Islands of Cook; in April, 1643, they were off

the north coast of New Guinea; and on June 15th Tasman returned to Batavia. In 1644 Tasman made a second voyage to effect a more full discovery of New Guinea.

The French directed their enterprise more in the direction of North America than of the Indies. One of their most distinguished naval worthies was Samuel Champlain, a native of Brouage in Saintonge. He died toward the end of the year 1635. Champlain was an able navigator and a resolute explorer, and he made a very large addition to the knowledge of Canada and Acadia (Nova Scotia).

The last expedition of the seventeenth century was purely scientific. In 1699 Edmund Halley, the astronomer-royal, in command of the *Paramour Pink*, undertook a voyage to improve the knowledge of longitude, and of the variation of the compass. The results of his voyage were the construction of a variation chart, and proposals for finding the longitude by occultations of fixed stars.

During the seventeenth century very considerable progress was made in the art of navigation, and in systematizing and delineating the vast mass of material that was accumulated by the ceaseless activity of explorers. The Dutch took the lead as map-makers. Mercator invented the useful projection which bears his name; and Ortelius, Hondius, and Hulsius compiled a series of valuable maps. In finding the latitude at sea, the astrolabe very generally gave place to the cross-staff, because the graduation of the latter was larger and more easily read off. The cross-staff was a very simple instrument, consisting of a graduated pole with cross pieces, called transversaries (of which there were four used according to the altitude), also graduated, which were fitted to work on it. The bearings of the sun were taken by compass to ascertain when it was near the meridian; then the end of the long staff was placed close to the observer's eye, and the transversary moved until one end exactly touched the horizon and the other the sun's center. This was continued until the sun dipped, when the meridian altitude was obtained. The back-staff was an improvement on the cross-staff, invented by the great Arctic navigator, John Davis. It was fitted with a reflector, and it was thus the first rough idea of the principle of the quadrant and sextant. The cross-staff was used for low altitudes, because both ends of the transversary could easily be seen at the same time, and the astrolabe for high altitudes. With the invention of these instruments came instructions for their use, and for working out observations. In England the first of these was *The Old Rutter of the Sea*, printed in 1490. Then followed the *Seaman's Secrets* of John Davis, and *A Regimen of the Sea, containing very necessary Matters, with a perfect Sea Card*, by Thomas Hood, published in 1596. Hood also sold compasses constructed on Mr. Norman's principle, near the Minorities. These manuals contained definitions, treatises on the use of the sea card and compass, tables of declination and rules for applying them, rules for dead reckonings and longitude, and instructions in the use of instruments. Latitude was obtained by observation, but longitude had usually to be reckoned on the chart from the meridian of Grand Canary, which in those days was used by all civilized countries. The differences of time between the eclipses of the moon at the place of the observer and the place for which it was calculated in the *ephemerides* for that day was another method in use of finding the difference of longitude. Mariners were also provided with tables giving the number of miles in a degree of longitude for every degree of latitude. Much attention was bestowed upon phenomena of the variation and dip of the magnetic

needle. Robert Norman, the hydrographer, discovered the dip or inclination of the needle in 1576, and in 1581 he observed the variation of the compass at London, and found it to be $11^{\circ} 15' E$. In the same year his *Discourse of the Magnet or Loadstone* was published by Ballard. In 1580 Mr. Borough, comptroller of the navy, found the variation of the compass at Limehouse to be $11^{\circ} 19' E$. It may be observed here that in 1657, there was no variation at London, and that it moved westerly until 1815, when it was $24^{\circ} 27' W$. It is now returning eastward.

By means of these rough instruments and calculations our Elizabethan navigators and their contemporaries succeeded in delineating the vast regions that were discovered. Thus the sum of human knowledge was augmented, while men's minds were enlarged, and the wealth and prosperity of nations were increased, through the provision of safe guides by which lands and seas could be traversed, and distant countries visited.

In the eighteenth century, to a far greater extent than had ever been the case before, geography began to be cultivated for its own sake, and expeditions were fitted out with the objects of discovery and of acquiring knowledge. The same objects also generally formed part of those enterprises which were avowedly undertaken for conquest, in the search of wealth, or from motives of religious zeal.

The improvement of scientific apparatus naturally went hand in hand with the progress of discovery. The great desideratum was the means of finding the longitude; and it was the creation of a commission for the discovery of longitude in 1713 which, so far as England is concerned, gave the greatest stimulus to inventions connected with geographical research. To the Board of Longitude is due the conception of the *Nautical Almanac*, and the establishment of a surveying branch of the naval service. The *Nautical Almanac* first appeared in 1767, under the auspices of Doctor Maskelyne, the astronomer-royal, who, by furnishing tables of lunar distances, supplied another means of finding the longitude. The invention by Hadley, in 1731, of the quadrant for use at sea, which entirely superseded the astrolabe and cross-staff, was a still greater improvement; and it was soon followed by better instruments on the same principle—the sextants of Dollond and Troughton. The work of travelers on land also became more accurate in proportion as instruments and maps were improved. Early explorers by land were content with itineraries and maps which only indicated distances. The introduction of observations by compass bearings was an important improvement; and after the invention of Hadley's quadrant, these rough route surveys began to be checked and verified by astronomical observations.

The most remarkable example of the early application of these improvements is to be found in the survey of China by the Jesuit missionaries.

Arabia received very careful attention, in the eighteenth century, from the Danish scientific mission, which included Carsten Niebuhr among its members. Niebuhr landed at Loheia, on the coast of Yemen, in December, 1762, and went by land to Sana. All the other members of the mission died, and he proceeded from Mocha to Bombay. He then made a journey through Persia and Syria to Constantinople, returning to Copenhagen in 1767. His invaluable work, the *Description of Arabia*, was published in 1772, and was followed in 1774–78 by two volumes of travels in Asia. The great traveler survived until 1815, when he died at the age of eighty-two. James Bruce of Kinnaird, the contemporary of Niebuhr, was equally devoted to Eastern travel. After studying Arabic and Geez for some years, he went out as consul to Algiers, and resided there

from 1762 to 1765, exploring and sketching the Roman ruins in Algiers and Tunis. In 1765 he traveled by land from Tunis to Tripoli, and then took passage for Candia, but was shipwrecked near Bengazi, and had to swim on shore. He eventually reached Candia, and, sailing thence to Sidon, traveled through Syria. In June, 1768, he landed at Alexandria in the dress of an Arab, and soon afterward we hear of him at Jiddah, the port of Mecca, in the dress of a Turkish sailor. He had resolved to attempt the discovery of the source of the Nile; and in 1769 he landed at Masowah, on the Abyssinian coast. He then penetrated to Axum and Gondar, and in November, 1770, he reached the source of the Abai, then supposed to be the main stream of the Nile. He thus attained the great object of his ambition. Returning by the desert into Egypt, Bruce reached England in 1774, and settled once more at his old home at Kinnaird after an absence of ten years. Urged by his old friend, Mr. Daines Barrington, the great traveler at length published his *Travels to Discover the Source of the Nile in the Years 1768-73* (5 vols. 4to) in 1790. Bruce, like many other conscientious and deserving explorers, was assailed by calumny and detraction. But every succeeding year has added to the high estimation in which his labors are held, and to the reverence with which his memory is cherished. He died at Kinnaird House, Stirlingshire, in 1794.

Before the death of Bruce an African Association was formed in 1788, for collecting information respecting the interior of that continent, with Major Rennell and Sir Joseph Banks as leading members, and Bryan Edwards as secretary. The association first employed a Mr. Ledyard to cross Africa from east to west on the parallel of the Niger, and Mr. Lucas to cross the Sahara to Fezzan. Ledyard, who had previously made a most extraordinary journey into Siberia, died at Cairo in 1788. Lucas went from Tripoli to Mesurata, obtained some information respecting Fezzan, and returned in 1789. One of the chief problems the Association wished to solve was that of the existence and course of the river Niger, which Maxwell believed to be identical with the Congo. Mungo Park, then an assistant surgeon of an Indian, volunteered his services, which were accepted by the Association, and in 1795 he arrived at the English factory of Pisania; 200 miles up the Gambia. Leaving this station in December he reached Ludamar, where a Moorish chief imprisoned him until the following July. He then crossed a mountainous tract to a Mandingo town called Kamalia. Quite destitute, and suffering from fever, he remained there for several months, but finally found his way back to Pisania, and returned to England. Five years afterward he accepted an offer from the government to command an expedition into the interior of Africa, the plan being to cross from the Gambia to the Niger, and descend the latter river to the sea. Park left the factory of Pisania, on the Gambia, on May 4, 1805, accompanied by Lieutenant Martyn and thirty-five soldiers, besides guides. All died but four during the rainy season, and the rest, including Mungo Park, perished in a rapid on the Niger, having been attacked from the shore by order of a chief who thought that he had not received suitable presents. Park was only thirty-five at the time of his death. The details respecting the fate of the ill-fated explorer and his party were obtained from the guide.

While the English were at work in the direction of the Niger, the Portuguese were not unmindful of their old exploring fame. In 1798 Doctor Lacerda, an accomplished astronomer, was appointed to command a scientific expedition of discovery to the north of the Zambesi. He started in July, crossed the Muchenja Mountains, and reached the capital of the Cazembe,

where he died of fever. Doctor Lacerda left a valuable record of his adventurous journey; but with Mungo Park and Lacerda the history of African exploration in the eighteenth century closes.

In South America scientific exploration was busily at work during this period. The great event of the century, as regards that continent, was the measurement of an arc of the meridian. The undertaking was proposed by the French Academy, and a commission left Paris in 1735, consisting of La Condamine, Bouguer, and Godin. Spain appointed two accomplished naval officers, the brothers Ulloa, as coadjutors. The operations were carried on during eight years on a plain to the south of Quito; and, in addition to his memoir on this memorable and most important measurement, La Condamine collected much valuable geographical information during a voyage down the Amazon. The arc measured $3^{\circ} 7' 3''$ in length; and the work consisted of two measured bases connected by a series of triangles, one north and the other south of the equator, on the meridian of Quito. Contemporaneously, in 1738, M. Maupertuis of St. Malo measured an arc of the meridian in Lapland. Another result of this expedition was the publication of a valuable work by the brothers Ulloa.

The English and French Governments dispatched several expeditions of discovery into the Pacific and round the world during the eighteenth century. They were preceded by those wonderful and romantic voyages of the buccaneers, of such men as Woodes Rogers, Davis, Shelvocke, Clapperton, and Dampier, which can never fail to interest, while they are not without geographical value. The works of Dampier are especially valuable, and the narratives of William Funnell and Lionel Wafel furnished the best accounts then extant of the isthmus of Darien. Dampier's literary ability eventually secured for him a commission in the king's service; and he was sent on a voyage of discovery, during which he explored part of the coasts of Australia and New Guinea, and discovered the strait which bears his name between New Guinea and New Britain, returning in 1701. In 1721 Jacob Roggwein was dispatched on a voyage of some importance across the Pacific by the Dutch West India Company, during which he discovered Easter Island on April 6, 1722.

The voyage of Lord Anson to the Pacific in 1740-44 was of a predatory character, and he lost more than half his men from scurvy; while it is not pleasant to reflect that at the very time when the French and Spaniards were measuring an arc of the meridian at Quito, the English under Anson were pillaging along the coast of the Pacific, and burning the town of Payta. But a romantic interest attaches to the wreck of the *Wager*, one of Anson's fleet, on a desert island near Chiloe, for it bore fruit in the charming narrative of Byron, which will endure for all time. In 1764 Captain Byron himself was sent on a voyage of discovery round the world, which led, immediately after his return, to the dispatch of another to complete his work, under the command of Captain Wallis.

The expedition, consisting of the *Dolphin* commanded by Captain Wallis, and the *Swallow* under Captain Carteret, sailed in September, 1766, but the ships were separated on entering the Pacific from the Straits of Magellan. Wallis discovered Tahiti on June 19, 1767, of which island he gave a detailed account, and Sir Charles Saunders' Island; he returned to England on May 17, 1768. Carteret discovered the Charlotte and Gloucester Islands, and Pitcairn Island on July 2, 1767; revisited the Santa Cruz group, which was discovered by Mendana and Quiros; and discovered the strait separating New Britain from New Ireland. He reached Spithead again on February 20, 1769. Wallis and Carteret were followed very closely by the French expedition of Bou-

gainville, which sailed from Nantes in November, 1776. Bougainville had first to perform to him the unpleasant task of delivering up the Falkland Islands (Malouines), where he had encouraged the formation of a French settlement, to the Spaniards. He then entered the Pacific, and reached Tahiti on April 2, 1768. Passing through the New Hebrides group he touched at Batavia, and arrived at St. Malo after an absence of two years and four months.

The three voyages of Cook form an era in the history of geographical discovery. All his work was thoroughly and completely done. He systematically surveyed every land he discovered, collecting information touching every branch of inquiry, so that his labors form a very large addition to geographical knowledge.

In 1785 the French Government fitted out a very carefully-prepared expedition of discovery at Brest, which was placed under the command of La Perouse, an accomplished and experienced officer. After touching at Concepcion, in Chili, and at Easter Island, La Perouse proceeded to the Sandwich Islands, and thence to the coast of California, of which he has given a very interesting account. He then went across the Pacific to Macao, and in July, 1787, he proceeded to explore the Gulf of Tartary and the shores of Saghalien, remaining some time at Castries Bay, so named after the French minister of marine. Thence he went to the Kurile Islands and Kamchatka, and sailed from the far north down a meridian to the Navigator and Friendly Islands. He was in Botany Bay in January, 1788; and sailing thence, the explorer, his ship, and crew were never seen again. Their fate was long uncertain. In September, 1791, Captain D'Entrecasteaux sailed from Brest with two vessels, to seek for tidings. He visited the New Hebrides, Santa Cruz, New Caledonia, and Solomon Islands, and made careful though rough surveys of the Louisiade Archipelago, islands north of New Britain, and part of New Guinea. D'Entrecasteaux died on board his ship on July 20, 1793, without ascertaining the fate of La Perouse. It was Captain Peter Dillon who at length ascertained, in 1828, that the ships of La Perouse were wrecked on the island of Vanikoro during a hurricane.

The work of Captain Cook bore fruit in many ways. His master, Captain Bligh, was sent in the *Bounty* to convey breadfruit plants from Tahiti to the West Indies. He reached Tahiti in October, 1788, and in April 1789 a mutiny broke out, and he, with several officers and men, was thrust into an open boat in mid-ocean. During the remarkable voyage he then made to Timor, Captain Bligh passed among the northern islands of the New Hebrides, which he named the Banks Group, and made several running surveys. He reached England in March, 1790. The *Pandora*, under Captain Edwards, was sent out in search of the *Bounty*, and discovered the islands of Cherry and Mitre, east of the Santa Cruz group, but she was eventually lost on a reef in Torres Strait. In 1796-97 Captain Wilson, in the missionary ship *Duff*, discovered the Gambier and other islands, and rediscovered the islands known to and seen by Quiros, but since called the Duff Group. Another result of Captain Cook's work was the colonization of Australia. On January 18, 1788, Admiral Phillip and Captain Hunter arrived in Botany Bay in the *Supply* and *Sirius*, followed by six transports, and established a colony at Port Jackson. Surveys were then undertaken in several directions. In 1795 and 1796 M. Flinders and G. Bass were engaged on exploring work in a small boat called the *Tom Thumb*. In 1797 Bass, who had been a surgeon, made an expedition southward, continued the work of Cook from Ram Head, and explored the strait

which bears his name, and in 1798 he and Flinders were surveying the east coast of Van Diemen's Land. The planting of a colony at Port Jackson led to the dispatch of an expedition to complete the exploration of the Australian coasts. The command was given to Capt. Matthew Flinders. He was furnished with a vessel called the *Investigator*, and sailed from England on July 18, 1801. Commencing from King George's Sound, Captain Flinders discovered and made a preliminary survey of all the south coast of Australia to Bass Strait, and the east coast from the barrier reef to Torres Strait, as well as the east coast of the Gulf of Carpentaria. Flinders met the French expedition under Baudin and Freycinet with two ships *Géographe* and *Naturaliste*, which was engaged upon the same work. He was taken prisoner by the French in 1804 and detained until 1810, so that his work did not appear before 1814.

In February, 1773, the Royal Society submitted a proposal to the king for an expedition to try how far navigation was possible toward the Pole. The *Race-horse* and *Carcass* bombs were selected as best adapted for the service, and Captains Phipps and Lutwidge were appointed to command them. The expedition sailed on June 2, 1773, and sighted the coast of Spitzbergen on the 28th. Captain Phipps stood into every opening he could find in the ice, but was invariably stopped by a solid barrier. He examined a line extending over twenty degrees of longitude, and found no opening in the heavy polar pack in any direction. After a very careful and persevering examination of the ice, the expedition returned to England in September. The highest latitude reached was 80° 48' N. But the most important Arctic work in the eighteenth century was performed by the Russians, for they succeeded in delineating the whole of the northern coast of Siberia. Some of this work, indeed, was done at a still earlier date.

The eighteenth century saw great progress in the collection and arrangement of geographical material, and in the work of surveying and map-making.

Toward the close of the century it was recognized that geography served more extensive and important uses than had ever before been supposed. The route survey was sufficient for the traveler or soldier, while accurate charts guided the mariner across the ocean. But surveys are also the basis of statistics and of administration, and rigorous accuracy became necessary. Surveys on a trigonometrical basis, which have been proceeding in all the countries in Europe (except Turkey) and in India during the present, were commenced in the last century. In Great Britain the Ordnance Survey was begun in April, 1784, when General Roy measured a base line on Hounslow Heath. The triangulation of the British Isles was commenced in 1784 and completed in 1852. Maps based on trigonometrical surveys may eventually explain and illustrate the physical aspect of the whole globe, but at present they are necessarily confined to those nations which are in the front rank of civilization. Countries which are not so advanced are still obliged to be content with such maps as sufficed for all the world in the last century, before the results of trigonometrical surveys were available.

South America had produced two eminent physical geographers, namely, Caldas of Bogota and Unanue of Lima, before the scenery of the Orinoco and the Andes became familiar to Europe through the charming narratives of Humboldt. It was in 1799 that the great Prussian naturalist embarked at Coruña, and landed at Cumana on the coast of Venezuela. His observant eye and bright imagination, combined with habits of scientific thought, produced pictures of the physical aspects of the region he explored which are quite unequalled.

The greatest and most important enterprise, after the peace of 1815, was the renewal of Arctic exploration under the auspices of Sir John Barrow.

The Russians, as well as the French, sent several voyages into the Pacific during the first half of the nineteenth century. In 1804 Admiral Krusenstern made a voyage round the world, and his pupil, Otto von Kotzebue, son of the dramatist, commanded the "Rurick" from 1815 to 1818 on a voyage of discovery. He discovered the great bay known as Kotzebue Sound, sounded in Behring Strait, and made careful observations of the currents. Wintering in California he returned to the Aleutian Islands in the following spring; and during the voyage homeward he discovered several new islands in the Pacific, especially Romanzoff and Krusenstern in the Dangerous Archipelago. During another Russian voyage, commanded by Billingshausen, Lazareff and other coral islands in the Dangerous Archipelago were discovered, and in 1828 Captain Lutke, in the *Seniavine*, surveyed the Caroline group. Captain Freycinet, the officer who served with Baudin and edited his work, also examined the Caroline Islands in the *Uranie* in 1819, but his voyage was mainly in the interests of natural history. Duperry in 1822-23 did some surveying work on the coast of New Ireland. But the most important French voyage was the Dumont D'Urville, who was sent out to seek for traces of La Perouse in 1828. He visited Tecopia and other islands in the *Astrolabe*, and was nearly a month at Vanikoro collecting relics of the ill-fated expedition. The voyage of D'Urville contributed largely to the advancement of science, and resulted in the publication of a magnificent work in 1830.

The only English scientific voyage to the Pacific in this period was sent out mainly to coöperate with Parry in his third voyage, and Franklin in his second journey. It was commanded by Captain Beechey, who had been first lieutenant with Parry during his first Arctic voyage, and on May 19, 1825, he sailed from Spithead in her majesty's ship *Blossom*. After visiting Easter, Gambia, Pitcairn and other islands, the *Blossom* arrived at Honolulu on May 20, 1826, and in July she was in Behring Strait, entering Kotzebue Sound on the 22d. Proceeding along the north coast of America, the ship's barge got to a low cape called Point Barrow, at the very time when Franklin and Back were at Return Reef. The accurate examination of the coast was made under circumstances which demanded great fortitude and perseverance, and reflects credit on the officers and crew. The *Blossom* returned to Honolulu in January, 1827, and arrived at Macao on the 12th of April. Captain Beechey next proceeded to survey the Loo Choo and Bonin Islands, and, after another visit to the far north, and the coasts of California and Mexico, he returned home by Cape Horn and arrived at Woolwich on October 12, 1828. His valuable and interesting narrative, in two volumes, was published in 1831. Mr. James Weddell, a master in the navy, made a voyage to the Antarctic Ocean in 1822-24, and went as far south as 74°.

The Royal Geographical Society was founded in 1830, and forms a landmark in the history of discovery. A similar society in Paris preceded that of London in point of time, and now every civilized country has established a Geographical Society.

Geographical discoverers of the nineteenth century have had a great work to do in Africa. D'Anville and his successors cleared off all that was uncertain on the map, all that had come from the information given by Duarte Lopez to Pigafetta, and from Leo Africanus, and left a great blank. James Bruce and Mungo Park, Clapperton and Tuckey, merely touched the edges or

penetrated in single lines across the vast unknown area. But they have been followed by many others, and now great progress has been made. In 1831 Monteiro and Gamitta were sent by the Portuguese Government, in the footsteps of La Cerda, to the capital of Cazembe; while, in 1849 and 1843-47, Ladislaus Magyar and Graça explored some of the southern affluents of the Congo. Rüppell (1838), Harris (1843), and Dr. Beke (1840), Lefebvre and Dillon (1839-43), Ferret and Gallinier (1847) improved the existing knowledge of Abyssinia, to which a further important contribution was made by the expeditionary field force sent in 1867-68 to enforce the release of English captives; and progress was made, under the auspices of the Egyptian Government, in exploring the White Nile above Khartoum. In 1849 the discoveries of Denham and Clapperton were followed up by Richardson, Overweg, and Barth, who, like their predecessors, went from Tripoli to Mourzouk, the capital of Fezzan. The two first died in Africa, but Dr. Barth returned home with a rich harvest of results. He reached Kouka, the capital of Bornou, on Lake Tchad, and in 1851 he visited the south side of that lake, and advanced some distance to the eastward. In 1852 he was at Saccatoo, where Clapperton died, whence he crossed the Niger and eventually reached Timbuctoo. After a stay of some months Dr. Barth left Timbuctoo in March, 1854, and got back to Tripoli in the end of 1855, being the sole survivor of his party. Dr. Vogel, in 1853-57, followed up the discoveries in the direction of Lake Tchad, and fell a victim to science; and the researches of Dr. Baikie in 1854 supplemented the work of the Landers in the lower part of the course of the Niger. Dr. Baikie also explored 250 miles of the river Chadda or Benue.

On the eastern coast of Africa, the missionaries Rebmann and Krapf ascertained the existence of the snowy peaks of Kenia and Kilimanjaro near the equator, and collected reports touching the equatorial lakes in the interior. This led to the expedition of Captain Burton in 1857, who, accompanied by Captain Speke, landed opposite to Zanzibar, and, advancing westward, discovered Lake Tanganyika. Captain Burton's admirable description of the region between the coast and the great lake he had discovered is one of the most valuable contributions to African descriptive geography. His companion, Captain Speke, made an excursion northward to the southern coast of a lake which he judged to be a main source of the Nile. In this belief he again set out in 1860 to attempt the achievement of a journey from Bagamoyo, opposite Zanzibar, to the Nile. This great enterprise was crowned with success. Speke traced out the western shore, and visited the northern outlet, of the Victoria Nyanza, the main reservoir of the White Nile. He then marched northward to Gondokoro, and descended the Nile. He had heard of a second great Nile reservoir, which Sir Samuel Baker discovered in 1864, and named the Albert Nyanza. The Bahr el Ghazel and other western feeders of the Nile were visited by Consul Petherick, and explored in 1868-71 by Doctor Schweinfurth, whose work ranks with that of Burton as a record of African discovery.

The travels of Doctor Livingstone in Southern Africa also added considerably to our knowledge of the geography of that continent. In 1848 he started from Cape Colony, visited Lake Ngami in 1849, and eventually reached the Portuguese town of St. Paul Loanda in 1855. Thence he marched across the continent, discovering the great falls and a considerable part of the course of the Zambesi. In his second expedition he proceeded up the Zambesi and its tributary the Shire, and discovered the Lake Nyassa. On his third and last expedition

he landed on the east coast at the mouth of the Rovuma, and made his way thence to Lake Nyassa. The great traveler then followed in the footsteps of Doctor Lacerda and Monteiro to the Cazenbe's capital, and thence to Lake Tanganyika. From Ujiji, on that lake, he made his way westward to the river Lualaba (the upper course of the Congo), returning in a destitute condition to Ujiji, he was there succored by Mr. Stanley. Finally he once more started, and died in the midst of his discoveries among the remoter sources of the Congo. Lieutenant Cameron's expedition in 1873 had for its main object the succor of Livingstone, but the news of the great traveler's death was received at Unyanyembe. Cameron then continued his march by a new route to Ujiji, and completed the survey of the southern half of Lake Tanganyika, discovering the Lukuga outlet. Thence he advanced westward across the Manyema country to Livingstone's furthest point at Nyangwe, crossed the Lualaba, and traversed the whole width of the African continent, reaching St. Paul Loanda on the west coast. Mr. Stanley followed in 1874. He circumnavigated and fixed the outline of the Victoria Nyanza, followed Cameron across Lake Tanganyika to Nyangwe, and then descended the great River Congo, discovering its course, and connecting the work of Livingstone with that of Tuckey. Mr. Young has since completed the survey of Lake Nyassa; Nachtigal has supplemented the work of Barth and Vogel in the Tchad region; while Duveyrier and other French explorers have examined the region of the Sahara. In the far south the Limpopo basin, and the country intervening between the Limpopo and Zambesi, have been made known to us by St. Vincent Erskine and Elton, Carl Mauch and Baines. In 1887 Mr. Stanley again started upon another expedition into Central Africa, the main object of which was to relieve Emin Pasha. He discovered Emin at Lake Nyanza on April 29, 1888. He announced as the chief feature of his geographical discoveries the establishment of the fact of the existence in the hitherto unsuspected portion of Africa of a lofty range of mountains—the old supposedly fabulous "Mountains of the Moon"—which are covered with perpetual snow. From these mountains the western branch of the Upper Nile rises. In addition to this many other streams have birth here, which feed the Semibiki river, in its turn emptying in Albert Nyanza—from which issues the true or Lower Nile. Into this lake the eastern branch of the Upper Nile also empties itself. This discovery has given rise to many speculations, the answers to which cannot as yet be given; and also has proven that the ancient travelers, who have been for so many ages derided for their accounts of snowy mountains in equatorial Africa, were not so wide of the mark as had been supposed. Thus the extent of the unknown parts of Africa has been rapidly curtailed, while our knowledge has been widened during the last half-century.

On the American continent scientific progress has been made in the United States and the dominion of Canada, where, within the last half-century, boundary commissions and surveys have fixed positions and described previously unknown regions of great extent. In South America there are vast unexplored regions to the eastward of the Andes, and in the basins of the great rivers. Sir Robert Schomburgk did much valuable work in Guiana, and explored the delta of the Orinoco in 1841; while Spix and Martius, Poeppig and Castelnau, Maw and Smyth, Herndon and Gibbon, Spruce and Bates, Wallace and Chandless, and others, explored the basin of the Amazon. The labors of Pissis in Chili, of Raimondi and Werthermann in Peru, of Codazzi in Colombia and Venezuela, and of Morales

and others in the Argentine Republic, have been most valuable to geographical science. In Patagonia, Fitz Roy and King explored the Santa Cruz river, Cox and Morales have since added to our knowledge, and Commander Musters, R.N., was the first traveler who traversed the whole of Patagonia from south to north, 660 miles of latitude, of which 780 were previously unknown to Europeans.

The difficulty of exploring the interior of the Australian continent was caused by the scarcity of water, and the immense distances it was necessary to cross without supplies of any kind. Hence the work of exploration has required and called forth high and noble qualities in a degree quite equal to any that have been recorded in any other part of the world. The names of Sturt and Leichhardt, of Eyre and Grey, of Macdougall Stewart and Burke, of Gregory, of Forrest and Warburton, will be handed down as those of intrepid and courageous explorers who laid open the secrets of the interior of Australia.

The Pacific Ocean was explored by numerous expeditions during the eighteenth and early part of the nineteenth centuries. Still much remained to be done in the way of verification and more complete survey. From 1826 to 1836 Captain Fitzroy, with the naturalist Darwin, surveyed Magellan's Strait and the west coast of South America; and further important surveys in the Pacific were afterward executed by Captain Wilkes of the United States Navy, and by Belcher, Kellett, and Denham.

But the great geographical work of the present century must be the extension of discovery in the Arctic and Antarctic regions. Progress has been made in both directions, and in both much remains to be done. It is this polar work which calls forth the highest qualities of an explorer; it is here that the greatest difficulties must be overcome; and it is here that the most valuable scientific results are to be obtained.

There is one great branch of physical geography which has only been effectively studied within the last thirty years, namely, the physical geography of the sea. Matthew Fontaine Maury, by his wind and current charts, by his trade wind, storm, rain, and whale charts, and above all by his charming work *The Physical Geography of the Sea*, gave the first impulse to this study. It was Captain Maury who organized the first deep-sea soundings in the North Atlantic, which up to that time was deemed to be unfathomable; and when his work was published, the illustrious Humboldt declared Maury to be the founder of a new and important science—the meteorology of the sea. He first took charge of the Washington Observatory in 1842; he resigned that post under a deep sense of duty in April, 1861, after a career of great usefulness; and he ended a noble and well-spent life in 1872. The investigations into the physical geography of the sea, which were combined into a system by Maury, have since been ably and zealously continued by others, among whom the names of Doctor Carpenter, Sir Wyville Thomson, and Professor Mohn of Christiania are preëminent. The voyage of the *Challenger* from 1873-1876, under Captains Nares and Thomson, with Sir Wyville Thompson as chief of the scientific staff, was organized with the object of examining and mapping the bottom of the ocean, of describing the fauna of the great depths, of ascertaining the temperatures at various depths, and of solving questions relating to oceanic circulation. The area thus explored in the Atlantic, Antarctic, Pacific, and Indian Oceans is of vast extent, and the researches, ably and zealously conducted, have resulted in an important addition to geographical knowledge.

In this rapid sketch of the history of geographical dis-

covery, the labors of numerous explorers during many generations have been enumerated; but its perusal will show that, notwithstanding all this work, there is much remaining to be done. Vast areas round both poles, and in the interior of Asia, Africa, South America, and New Guinea, are still unknown, even more extensive regions have only been partially explored, and millions of square miles remain to be surveyed, before the work of geographers is complete.

MATHEMATICAL GEOGRAPHY.

All our knowledge of the planet on which we live, whether obtained from the explorations of travelers, the voyages of navigators, or the discoveries of astronomers in modern times, goes to confirm the doctrine held and taught by philosophers in a remote antiquity that the earth is spherical. What is spherical, however, is not the actual surface of the earth, but rather that of the sea, produced in imagination to pass through the continents. That the surface of the sea is convex, any one may—at a seaside station where there is a high cliff—convince himself, by noting with a telescope at the top of the cliff the exact appearance of a ship in, or slightly beyond, the horizon, and then, immediately after, repeating, at the foot of the cliff, the same observation on the same ship. By a more precise observation of the sea horizon from a known altitude one may even calculate the radius of the earth.

The first great fact in the description of the earth being that it is spherical (or at any rate so nearly so that, were a perfect model of it constructed, no one could, by unaided vision, discover that it is not spherical), the next points to be noted are—secondly, that the earth rotates uniformly round an axis passing through its center, and fixed, or very nearly fixed as to direction, in space; and, thirdly, that its figure is not spherical, but spheroidal, the surface being that found by the revolution of an ellipse round its minor axis, the axis of figure corresponding with the axis of diurnal rotation. The spheroidal figure is a necessary consequence of the rotation. The rotation of the earth in twenty four hours is made evident by the rising and setting of the heavenly bodies.

The poles of the earth are the points in which the axis of rotation, or of figure, meet the surface; and the equator is the circle in which the surface is intersected by a plane through the earth's center, perpendicular to the axis of rotation. Every point of the equator is therefore equidistant from the poles.

To determine the position of a point in space three coordinates or measurements are necessary; they may be three lines, or two lines and one angle, or two angles and one line. Thus, to define the precise position of a point on the earth's surface, we express it by latitude, longitude and altitude; the first two are angular measures, the third a linear magnitude, namely, the height above the surface of the sea.

The line in which the surface of the earth is intersected by a plane through the axis of rotation is called a meridian, and all meridians are evidently similar curves. A line perpendicular to the surface at any point is called a vertical line; it corresponds with the direction of gravity there; being produced outward, that is, away from the earth's center, it meets the heavens in the *zenith*; and produced downward it intersects the axis of revolution; it would, of course, pass through the earth's center were it a sphere; as it is, it passes *near* the earth's center.

The angle between the meridian planes of two stations as A and B is called the difference of longitude of A and B, or the longitude of B with reference to A. In British maps the longitudes of all places are expressed with reference to the Royal Observatory of Greenwich.

In America, Washington is the initial point, while the Portuguese formerly reckoned from the Azores, which they considered the end of the earth.

The latitude of any point is the angle made by the vertical line there with the plane of the equator, or the co-latitude in the angle between the vertical line and the axis of rotation. The surface of the earth being one of revolution, any intersecting plane parallel to the equator cuts it in a circle. If we imagine the vertical lines drawn at any two points, as P and Q, in such a circle, it is evident from the symmetry of the surface that these verticals make the same angle with the equator; in other words, the latitudes of all points on this circle are equal. Such circles are called parallels; they intersect meridians at right angles.

If we suppose that at any point Q of the surface the meridian, or a small bit of it, is actually traced on the surface, and also a portion of the parallel through the same point, then these lines, crossing at right angles in Q, mark there the directions which we call north and south, east and west—the meridian lying north and south, the parallel east and west. Planes containing the vertical line at Q are vertical planes there. A vertical plane is defined by its azimuth, which is the angle it makes with the meridian plane; the azimuth at Q of any object (or point) celestial or terrestrial is the right angle which the vertical plane passing through the object makes with the meridian. The south meridian is generally taken as the zero of azimuth. The plane touching the surface at Q is the visible horizon there—a plane parallel to this through the center of the earth being called the rational horizon. The altitude at Q of a heavenly body, as a star, is the angle which the line drawn from Q to the star makes with the plane of the horizon—the zenith distance of the same star being the angle between its direction and the vertical at Q.

By a degree of the meridian is meant this: if E, F are points on the same meridian such that the directions of their verticals make with each other an angle of one degree—a ninetieth part of a right angle—then the distance between E and F measured along the meridian is a degree of the meridian. As the radius of curvature of an ellipse is variable, increasing from the extremity of the major axis to the extremity of the minor axis, so on the earth's surface a degree of the meridian is found by geodetic measurement to increase from the equator to the poles.

The actual length of a degree of the meridian at the equator is 362746.4 feet; at either pole it is 366479.8 feet. The length of one degree of the equatorial circle is 365231.1 feet.

With regard to the figure of the earth as a whole, the polar radius is 3949.79 miles, and the radius of the equator 3963.30 miles; the difference of these, called the ellipticity, is $\frac{1}{293}$ of the mean radius. A spheroid with these semiaxes is equivalent in volume to a sphere having a radius of 3958.79 miles. Without referring further here to the spheroidal figure, we shall now, having given the precise dimensions, regard the earth as a sphere whose radius is 3959 miles. On such a sphere one degree is 69.09 miles. From the definitions given above it appears that the radius of the parallel which corresponds to all points whose latitude is Φ is $3959 \cos \Phi$; and that one degree of this circle, *i.e.*, one degree of longitude in the latitude Φ is $69.09 \cos \Phi$ expressed in miles.

The latitudes and longitudes of places on the earth's surface are determined by observations of the stars, of the sun, and of the moon. As the earth rotates, the zenith of any place (not being on the equator) traces out among the stars a small circle having for center that point in which the axis of rotation meets the heavens.

If there were a star at this last point it would be apparently motionless, having always the same altitude and azimuth. The pole star, though very conveniently near the north pole of the heavens, and without perceptible motion to the unaided eye, is in reality moving in a very small circle. The zenith of a point on the equator traces out in the heavens a great circle, namely, the celestial equator.

As the positions of points on the earth are defined with reference to the equator and a certain fixed meridian, so the positions of stars are defined by their angular distance from the celestial equator, called in this case declination, and by their right ascension, which corresponds to terrestrial longitude. Stars which are on the same meridian plane (extended to the heavens) have the same right ascension. Right ascension is expressed in time from 0 h. to 24 h. A sidereal clock, going truly, indicates 24 h. for every revolution of the earth; at every observatory, the sidereal clock there shows, at each moment, the right ascension of the stars which at that moment are on the meridian. Thus the right ascension of the zenith is the sidereal time.

Observations on the sun have shown that it traces out amongst the stars in the course of a year a great circle, inclined to the equator at an angle of $23\frac{1}{2}^{\circ}$; at midsummer it attains a maximum northern declination of $23\frac{1}{2}^{\circ}$, and at midwinter a maximum southern declination of the same amount. Hence it is inferred that the earth moves round the sun in a plane, completing one orbital revolution yearly, the axis of the earth's diurnal rotation being inclined to this plane at an angle of $66\frac{1}{2}^{\circ}$. Upon this angle of inclination depend the seasons, and in a great measure the climates of the different portions of the earth's surface.

It is usual to draw on globes and in maps a circle or parallel at the distance of $23\frac{1}{2}^{\circ}$ from the equator on either side; of these circles the northern is called the Tropic of Cancer, the southern is the Tropic of Capricorn. A circle drawn with a radius of $23\frac{1}{2}^{\circ}$ from the North Pole as center is the Arctic Circle; a similar and equal circle round the South Pole is the Antarctic Circle.

When the sun is in the equator—which it crosses from north to south in September, and from south to north in March—it is in the horizon of either pole. When the sun has northern declination, the North Pole is in constant daylight and the South Pole in darkness. When the sun has southern declination the North Pole on the contrary is in constant darkness while the South Pole is illuminated by sunshine. At midsummer in the northern hemisphere the whole region within the Arctic Circle is in constant daylight, and that within the Antarctic Circle is in darkness; at midwinter this state of things is exactly reversed. The portion of the globe lying between the Tropic of Cancer and the Arctic Circle is called the North Temperate Zone; that between the Tropic of Capricorn and the Antarctic Circle is the South Temperate Zone. In the former the sun is always to the south of the zenith; in the latter it is always to the north.

In the Torrid Zone, which lies between the Tropics, the sun, at any given place, passes the meridian to the north of the zenith for part of the year, and to the south for the remainder.

When the sun is to the north of the equator the days are longer than the nights in the northern hemisphere, while in the southern hemisphere the nights are longer than the days; when the sun has southern declination this position is reversed. As the sun increases his north declination from 0° to $23\frac{1}{2}^{\circ}$, not only do the days increase in length in the northern hemisphere, but the rays of the sun—in the Temperate and Arctic

regions—impinge more perpendicularly on the surface; hence the warmth of summer. Even in summer the rays of the sun in the Arctic regions strike the surface very obliquely; this, combined with the protracted season of darkness, produces excessive cold. Summer in the northern hemisphere is thus contemporaneous with winter in the southern; while winter in the northern hemisphere is simultaneous with summer in the southern.

Construction of Maps.—In the construction of maps, one has to consider how a portion of spherical surface, or a configuration traced on a sphere, can be represented on a plane. If the area to be represented bear a very small ratio to the whole surface of the sphere, the matter is easy: thus, for instance, there is no difficulty in making a map of a parish, for in such cases the curvature of the surface does not make itself evident. If the district is larger and reaches the size of the county, Cook County, for instance, then the curvature begins to be sensible, and one requires to consider how it is to be dealt with. The sphere not being a developable surface cannot be opened out into a plane like the cone or cylinder, consequently in a plane representation of configurations on a sphere it is impossible to retain the desired proportions of lines or areas or equality of angles. But though one cannot fulfill all the requirements of the case, we may fulfill some by sacrificing others; that is to say, we may, for instance, have in the representation exact similarity to all very small portions of the original, but at the expense of the areas, which will be quite misrepresented. Or we may retain equality of areas if we give up the idea of similarity. It is therefore usual, excepting in special cases, to steer a middle course, and, by making compromises, endeavor to obtain a representation which shall not offend the eye.

A globe gives a perfect representation of the surface of the earth; but practically, the necessary limits to its size make it impossible to represent in this manner the details of countries. A globe of the ordinary dimensions serves scarcely any other purpose than to convey a clear conception of the earth's surface as a whole, exhibiting the figure, extent, position, and general features of the continents and islands, with the intervening oceans and seas; and for this purpose it is indeed absolutely essential and cannot be replaced by any kind of map.

The construction of a map virtually resolves itself into the drawing of two sets of lines, one set to represent meridians, the other to represent parallels. These being drawn, the filling in of the outlines of countries presents no difficulty. The first and most natural idea that occurs to one as to the manner of drawing the circles of latitude and longitude is to draw them according to the laws of perspective. But, as Lagrange has remarked, one may regard geographical maps from a more general point of view as representations of the surface of the globe, for which purpose we have but to draw meridians and parallels according to any given law; then any place we have to fix must take that position with reference to these lines that it has on the sphere with reference to the circles of latitude and longitude.

PHYSICAL GEOGRAPHY.

This term in its ordinary acceptance means a description of the physical features of the earth. It includes an account of the phenomena of the atmosphere; of the composition, distribution, and movements of the sea; of the forms of the land, with its water circulation, earthquakes, and volcanoes; of the distribution of plant and animal life. Its object, however, is not to present a mere bald enumeration of facts, but to group the facts together in such a way as to bring before the mind a luminous picture of the whole structure and working of

the earth as a habitable planet. Physical geography is not so much a science or branch of science as a collection of the data ascertained, and probable conclusions arrived at, by different sciences, in so far as these bear upon its own subject. Accordingly, it culls from all departments of inquiry whatever helps to give additional distinctness and vividness to that broad conception of the daily economy of the globe which it is its aim to form and develop.

GEOLOGY is the science which investigates the history of the earth. Its object is to trace the progress of our planet from the earliest beginnings of its separate existence, through its various stages of growth, down to the present condition of things. It seeks to determine the manner in which the evolution of the earth's great surface features has been effected. It unravels the complicated processes by which each continent has been built up. It follows, even into detail, the varied sculpture of mountain and valley, crag and ravine. Nor does it confine itself merely to changes in the inorganic world. Geology shows that the present races of plants and animals are the descendants of other and very different races which once peopled the earth. It teaches that there has been a progress of the inhabitants, as well as one of the globe on which they dwelt; that each successive period in the earth's history, since the introduction of living things, has been marked by characteristic types of the animal and vegetable kingdoms; and that, however imperfectly they have been preserved or may be deciphered, materials exist for a history of life upon the planet. The geographical distribution of existing faunas and floras is often made clear and intelligible by geological evidence; and in the same way light is thrown upon some of the remoter phases in the history of man himself. A subject so comprehensive as this must require a wide and varied basis of evidence. It is one of the characteristics of geology to gather evidence from sources which at first sight seem far removed from its scope, and to seek aid from almost every other leading branch of science. Thus, in dealing with the earliest conditions of the planet, the geologist must fully avail himself of the labors of the astronomer. Whatever is ascertainable by telescope, spectroscope, or chemical analysis, regarding the constitution of other heavenly bodies, has a geological bearing. The experiments of the physicist, undertaken to determine conditions of matter and of energy, may sometimes be taken as the starting-points of geological investigation. The work of the chemical laboratory forms the foundation of a vast and increasing mass of geological inquiry. To the botanist, the zoölogist, even to the unscientific, if observant, traveler by land or sea, the geologist turns for information and assistance.

But while thus culling freely from the dominions of other sciences, geology claims as its peculiar territory the rocky framework of the globe. In the materials composing that framework, their composition and arrangement, the processes of their formation, the changes which they have undergone, and the terrestrial revolutions to which they bear witness, lie the main data of geological history. It is the task of the geologist to group these elements in such a way that they may be made to yield up their evidence as to the march of events in the evolution of the planet. He finds that they have, in large measure, arranged themselves in chronological sequence — the oldest lying at the bottom and the newest at the top. Relics of an ancient sea-floor are overlaid by traces of a vanished land-surface; these are in turn covered by the deposits of a former lake, above which once more appear proofs of the return of the sea. Among these rocky records lie the lavas and ashes of long-extinct volcanoes. The ripple left upon the shore,

the cracks formed by the sun's heat upon the muddy bottom of a dried-up pool, the very imprint of the drops of a passing rain-shower, have all been accurately preserved, and yield their evidence as to geological conditions widely different from those which exist where such markings are now found.

But it is mainly by the remains of plants and animals imbedded in the rocks that the geologist is guided in unraveling the chronological succession of geological changes. He has found that a certain order of appearance characterizes these organic remains, that each great group of rocks is marked by its own special types of life, and that these types can be recognized, and the rocks in which they occur can be correlated, even in distant countries, and where no other means of comparison would be possible. At one moment he has to deal with the bones of some large mammal scattered through a deposit of superficial gravel, at another time with the minute foraminifers and ostracods of an upraised seabottom. Corals and crinoids crowded and crushed into a massive limestone, where they lived and died, ferns and terrestrial plants matted together into a bed of coal where they originally grew, the scattered shells of a submarine sand-bank, the snails and lizards which lived and died within a hollow tree, the insects which have been imprisoned within the exuding resin of old forests, the footprints of birds and quadrupeds, the trails of worms left upon former shores — these, and innumerable other pieces of evidence, enable the geologist to realize, in some measure, what the faunas and floras of successive periods have been, and what geographical changes the site of every land has undergone.

It is evident that to deal successfully with these varied materials, a considerable acquaintance with different branches of science is needful. Especially necessary is a tolerably wide knowledge of the processes now at work in changing the surface of the earth, and of at least those forms of plant and animal life whose remains are apt to be preserved in geological deposits, or which in their structure and habits enable us to realize what their foreunners were. It has often been insisted upon that the present is the key to the past; and in a wide sense this assertion is eminently true. Only in proportion as we understand the present, where everything is open on all sides to the fullest investigation, can we expect to decipher the past, where so much is obscure, imperfectly preserved, or not preserved at all. A study of the existing economy of nature ought thus to be the foundation of the geologist's training.

While, however, the present condition of things is thus employed, we must obviously be on our guard against the danger of unconsciously assuming that the phase of nature's operations which we now witness has been the same in all past time, that geological changes have taken place in former ages in the manner and on the scale which we behold to-day, and that at the present time all the great geological processes, which have produced changes in the past eras of the earth's history, are still existent and active. Of course we may assume this unity of action, and use the assumption as a working hypothesis. But it ought not to be allowed any firmer footing, nor on any account be suffered to blind us to the obvious truth that the few centuries wherein man has been observing nature form much too brief an interval by which to measure the intensity of geological action in all past time. For aught we can tell the present is an era of quietude and slow change, compared with some of the eras which have preceded it. Nor can we be sure that, when we have explored every geological process now in progress, we have exhausted all the causes of change which, even in comparatively recent times, have been at work.

In dealing with the Geological Record, as the accessible solid part of the globe is called, we cannot too vividly realize that at the best it forms but an imperfect chronicle. Geological history cannot be compiled from a full and continuous series of documents. From the very nature of its origin the record is necessarily fragmentary, and it has been further mutilated and obscured by the revolutions of successive ages. And even where the chronicle of events is continuous, it is of very unequal value in different places. In one case, for example, it may present us with an unbroken succession of deposits many thousands of feet in thickness, from which, however, only a few meager facts as to geological history can be gleaned. In another instance it brings before us, within the compass of a few yards, the evidence of a most varied and complicated series of changes in physical geography, as well as an abundant and interesting suite of organic remains. These and other characteristics of the geological record will become more apparent and intelligible as we proceed in the study of the science.

In the systematic treatment of the subject the following arrangement may be followed:

1. *The Cosmical Aspects of Geology*.—Under this head we may consider the evidence supplied by astronomy and physics regarding the form and motions of the earth, the composition of the sun and planets, and the probable history of the solar system.

2. *Geogenosy—an Inquiry into the Materials of the Earth's Substance*.—In this division we deal with the parts of the earth, its envelopes of air and water, its solid crust, and the probable condition of its interior. Especially, we have to study the more important minerals of the crust, and the chief rocks of which that crust is built up. In this way we lay a foundation of knowledge regarding the nature of the materials constituting the mass of the globe, and may next proceed to investigate the processes by which these materials are produced and altered.

3. *Dynamical Geology* embraces an investigation of the various agencies whereby the rocks of the earth's crust are formed and metamorphosed, and by which changes are effected upon the distribution of sea and land, and upon the forms of terrestrial surfaces. Such an inquiry necessitates a careful study of the existing geological economy of nature, and forms a fitting introduction to the investigation of the geological changes of former periods. This and the previous section include most of what is embraced under Physical Geography; and for the reason stated under that heading the subject will here be treated more in detail than is usual in geological treatises.

4. *Structural Geology, or the Architecture of the Earth*.—We now advance to consider how the various materials composing the crust of the earth have been arranged. We learn that some have been formed in beds or strata on the floor of the sea, that others have been built up by the slow aggregation of organic forms, that others have been poured out in a molten condition or in showers of loose dust from subterranean sources. We further find that, though originally laid down in almost horizontal beds, the rocks have subsequently been crumpled, contorted and dislocated, that they have been incessantly worn down, and have often been depressed and buried beneath later accumulations.

5. *Palaontological Geology*.—This branch of the subject deals with the organic forms which are found preserved in the crust of the earth. It includes such questions as the relations between extinct and living types, the laws which appear to have governed the distribution of life in time and in space, the relative importance of different genera of animals in geological in-

quiry, the nature and use of the evidence from organic remains regarding former conditions of physical geography. This subject will be more properly discussed in the article PALAONTOLOGY, and will, therefore, be only cursorily treated in the following pages.

6. *Stratigraphical Geology*.—This section might be called geological history. It works out the chronological succession of the great formations of the earth's crust, and endeavors to trace the sequence of events of which they contain the record. More particularly it determines the order of succession of the various plants and animals which in past time have peopled the earth, and thus ascertains what has been the grand march of life upon the planet.

7. *Physiographical Geology*, starting from the basis of fact laid down by stratigraphical geology regarding former geographical changes, embraces an inquiry into the origin and history of the features of the earth's surface—continental ridges and ocean basins, plains, valleys and mountains. It explains the causes on which local differences of scenery depend, and shows under what very different circumstances, and at what widely separated intervals, the hills and mountains, even of a single country, have been produced.

COSMICAL ASPECTS OF GEOLOGY.

Before geology had attained to the position of an inductive science, it was customary to begin all investigations into the history of the earth by propounding or adopting some more or less fanciful hypothesis in explanation of the origin of our planet, or even of the universe. Such preliminary notions were looked upon as essential to a right understanding of the manner in which the materials of the globe had been put together. To the illustrious James Hutton (1785) geologists are indebted for strenuously upholding the doctrine that it is no part of the province of geology to discuss the origin of things. He taught them that in the materials from which geological evidence is to be compiled there can be found "no traces of a beginning, no prospect of an end." In England, mainly to the influence of the school which he founded, and to the subsequent rise of the Geological Society (1807) which resolved to collect facts instead of fighting over hypotheses, is due the disappearance of the crude and unscientific cosmologies by which the writings of the earlier geologists were distinguished.

But there can now be little doubt that in the reaction against those visionary and often grotesque speculations, geologists were carried too far in an opposite direction. In allowing themselves to believe that geology had nothing to do with the questions of cosmogony, they gradually grew up in the conviction that such questions could never be other than mere speculation, interesting or amusing as a theme for the employment of the fancy, but hardly coming within the domain of sober and inductive science. Nor would they soon have been awakened out of this belief by anything in their own science. It is still true that in the data with which they are accustomed to deal, as comprising the sum of geological evidence, there can be found no trace of a beginning. The oldest rocks which have been discovered on any part of the globe have probably been derived from other rocks older than themselves. Geology by itself has not yet revealed, and is little likely ever to reveal, a trace of the first solid crust of our globe. If then geological history is to be compiled from direct evidence furnished by the rocks of the earth, it cannot begin at the beginning of things, but must be content to date its first chapter from the earliest period of which any record has been preserved among the rocks.

RELATIONS OF THE EARTH TO THE SOLAR SYSTEM.

Before entering upon the study of the structure and history of the earth, we may with advantage consider the general relations of our planet to the solar system, especially in view of its origin and history. It is now regarded as in the highest degree probable that all the members of that system have had a common origin. The investigations of recent years have revived and given a new form and meaning to the well-known nebular hypothesis, in which Laplace sketched the progress of the system from the state of an original nebula to its existing condition of a central incandescent sun with surrounding cool planetary bodies. He supposed that the nebula, originally diffused at least as far as the farthest member of the system, began to condense toward the center, and that in so doing it threw off or left behind successive rings which on disruption and further condensation assumed the form of planets, sometimes with a further formation of rings, which in the case of Saturn remain, though in other planets they have broken up and united into satellites.

According to this view we should expect that the matter composing the various members of the solar system should be everywhere nearly the same. The fact of condensation around centers, however, indicates at least differences of density throughout the nebula. Mr. Lockyer has, indeed, suggested that the materials composing the nebula arranged themselves according to their respective densities, the lightest occupying the exterior and the heaviest the interior of the mass. And if we compare the densities of the various planets, they certainly seem to support this suggestion. These densities are shown in the following table, that of the earth being taken as the unit:

Density of the Sun.....	0.25
" Mercury.....	1.12
" Venus.....	1.03
" Earth.....	1.00
" Mars.....	0.70
" Jupiter.....	0.24
" Saturn.....	0.13
" Uranus.....	0.17
" Neptune.....	0.16

There is not indeed a strict progression in the diminution of density, but the fact remains that, while the planets near the sun are about twice as heavy as they would be if they consisted of such a substance as granite, toward the outer limits of the system they are composed of matter as light as cork. Again, in some cases, a similar relation has been observed between the densities of the satellites and their primaries. The moon, for example, has a density little more than half that of the earth. The first satellite of Jupiter is less dense, though the other three are found to be more dense than the planet. Further, in the condition of the earth itself, a very light gaseous atmosphere forms the outer portion, beneath which lies a heavier layer of water, while within these two envelopes the materials forming the solid substance of the planet are so arranged that the outer layer or crust has only about half the density of the whole globe. Mr. Lockyer finds in the sun itself evidence of the same tendency toward a stratified arrangement in accordance with relative densities, as will be immediately further alluded to.

There seems therefore to be much probability in the hypothesis that, in the gradual condensation of the original nebula, each successive mass left behind represented the density of a parent layer, and consisted of progressively heavier matter. The remoter planets, with their low density and vast absorbing atmospheres, may be supposed to consist of metalloids like the outer parts of the sun's atmosphere, while the interior planets

are no doubt mainly metallic. The rupture of each planetary ring would, it is conceived, raise the temperature of the resultant nebulous planet to such a height as to allow the vapors to rearrange themselves by degrees in successive layers, or rather shells, according to density. And when the planet gave off a satellite, that body would, it might be expected, have the composition and density of the outer layers of its primary.

For many years the only evidence available as to the actual composition of other heavenly bodies than our own earth was furnished by the *aërolites*, *meteorites*, or falling stars, which from time to time have entered our atmosphere from planetary space, and have descended upon the surface of the globe. Subjected to chemical analysis these foreign bodies show considerable diversities of composition; but in no case have they yet yielded a trace of any element not already recognized among terrestrial materials. Upward of twenty of our elements have been detected in *aërolites*, sometimes in the free state, sometimes combined with each other. More than half of them are metals, including iron, nickel, manganese, calcium, sodium, and potassium.

But in recent years a far more precise and generally applicable method of research into the composition of the heavenly bodies has been found in the spectroscope. By means of this instrument, the light emitted from self-luminous bodies can be analyzed in such a way as to show what elements are present in their intensely hot luminous vapor.

By this method of examination it has been ascertained that many of the elements of which our earth is composed exist in the state of incandescent vapor in the atmosphere of the sun.

The spectroscope has likewise been successfully applied by Mr. Huggins and others to the observation of the fixed stars and nebulae, with the result of establishing a similarity of elements between our own system and other bodies in sidereal space. In the radiation spectra of nebulae Mr. Huggins finds the hydrogen lines very prominent; and he conceives that they may be glowing masses of that element. Sir William Thomson and Professor Tait have suggested, on the other hand, that they are more probably clouds of stones in rapid motion, perhaps in an atmosphere of hydrogen. Among the fixed stars absorption spectra have been recognized, pointing to a structure resembling that of our sun, viz.: a solid or liquid incandescent nucleus, surrounded with an atmosphere of glowing vapor. According to Mr. Lockyer, those stars or nebulae which have the highest temperature have the simplest spectra, and in proportion as they cool their materials become more and more differentiated into what we call elements. He remarks that the most brilliant or hottest stars show in their spectra only the lines of gases, as hydrogen. Cooler stars, like our sun, give indications of the presence, in addition, of the more stable metals—magnesium, sodium, calcium, iron. A still lower temperature he regards as marked by the appearance of the other metals, metalloids and compounds, so that the older a star or planet is the more will it lose free hydrogen, till when it comes to the condition of our earth, all its free hydrogen will have disappeared. According to this view the atoms of all the elements existed originally in the nebula dissociated from each other by reason of the intense heat. As the nebula gravitated toward its nucleus and cooled, the atoms came together, and the elements appeared in a certain order, beginning with hydrogen, and passing on through the metals and metalloids into compounds such as we find on our globe. The sun would thus be a star considerably advanced in the process of differentiation or association of its atoms. It contains, so far as we know, no metalloids or compounds. while

stars like Sirius show the presence only of hydrogen, with but a feeble proportion of metallic vapors; and on the other hand, the red stars indicate by their spectra that their metallic vapors have entered into combination, whence it is inferred that their temperature is lower than that of our sun.

Further confirmation of these views as to the order of planetary evolution is furnished by the form and structure of the earth. Reference has already been made to the fact that the outer crust of our planet possesses only about half the density of the whole mass. It consists largely of metalloids—oxygen, silicon, carbon, sulphur, chlorine. On the other hand, lavas and mineral veins, which are believed to have been supplied from some considerable depth, contain abundance of metallic ingredients.

The form of the globe likewise points to a former fluid condition. As the result of computations from ten measured arcs of the meridian, made by different observers, between the latitudes of Sweden and the Cape of Good Hope, Bessel obtained the following data for the dimensions of the earth:

Equatorial diameter.....	41,847,192 feet, or	7,925,604 miles.
Polar diameter.....	41,707,314 “ “	7,899,114 “
Amount of polar flattening	139,768 “ “	26.471 “

The equatorial circumference is thus a little less than 25,000 miles, and the difference between the polar and equatorial diameters (nearly $26\frac{1}{2}$ miles) amounts to about $\frac{1}{300}$ of the equatorial diameter. More recently, however, it has been shown that the oblate spheroid indicated by these measurements is not a symmetrical body, the equatorial circumference being an ellipse instead of a circle.

In obedience to the influence of rotation on its axis, our planet would tend to assume exactly such a flattening at the poles as it has been proved to possess. This was discovered and demonstrated by Newton, and the amount of the ellipticity was actually calculated by him, long before any measurement had confirmed such a conclusion.

GEOGNOSY.

Before we enter upon any discussion of the geological changes which our planet has undergone, it is needful first of all to study the materials of which the planet consists. It is from the evidence furnished by the nature and arrangement of these materials that geological history must be compiled.

Viewed in a broad way then, the earth may be considered as consisting of (1) two envelopes—an outer one of gas completely surrounding the planet, and an inner one of water covering about three-fourths of the globe; and (2) a globe cool and solid on its surface but possessing a high internal temperature.

THE ENVELOPES.

The Atmosphere.—The gaseous envelope to which the name of atmosphere is given extends at least to a distance of forty or forty-five miles from the earth's surface, perhaps in a state of extreme tenuity to a much greater height. But its thickness must necessarily vary with latitude and changes in atmospheric pressure; the layer of air lying over the poles is not so deep as that which surrounds the equator.

Many speculations have been made regarding the chemical composition of the atmosphere during former geological periods. There can indeed be no doubt that it must originally have differed very greatly from its present condition. The oxygen which now forms fully a half of the outer crust of the earth was originally doubtless part of the atmosphere. So, too, the vast beds of coal found all over the world, in geological formations of many different ages, represent so much carbonic acid once present in the air. The chlorides in

the sea likewise were probably carried down out of the atmosphere in the primitive condensation of the aqueous vapor. It has often been suggested that during the Carboniferous period the atmosphere must have been warmer and with more aqueous vapor and carbonic acid in its composition than at the present day, to admit of so luxuriant a flora as that from which the coal seams were formed. There seems, however, to be at present no method of arriving at any certainty on this subject.

As now existing, the atmosphere is considered to be normally a mechanical mixture of nearly four volumes of nitrogen and one of oxygen, with a minute proportion of carbonic acid, and still smaller quantities of other substances. Expressed in a tabular form this composition is as follows:

Nitrogen.....	79.00
Oxygen.....	20.96
Carbonic acid.....	0.04

The Oceans.—About three-fourths of the surface of the globe (or about 144,712,000 square miles) is covered by the irregular sheet of water known as the sea. Within the last ten years much new light has been thrown upon the depths, temperatures, and biological conditions of the ocean-basins, more particularly by the *Lightning*, *Porcupine*, and *Challenger* expeditions fitted out by the British Government.

The water of the oceans is distinguished from the ordinary terrestrial waters by a higher specific gravity, and the presence of so large a proportion of saline ingredients as to impart a strongly salt taste. The average density of sea-water is about 1.026, but it varies slightly in different parts even of the same ocean.

The greater density of sea-water depends of course upon the salts which it contains in solution. There seems no reason to doubt that these salts are, in the main, parts of the original constitution of the sea, and thus that the sea has always been salt. It is also probable that, as in the case of the atmosphere, the composition of the ocean water has in former geological periods been very different from what it is now, and that it has acquired its present character only after many ages of slow change, and the abstraction of much mineral matter originally contained in it. There is evidence indeed among the geological formations that large quantities of lime, silica, chlorides, and sulphates have in the course of time been removed from the sea.

THE SOLID GLOBE.

General Considerations.—Within the atmospheric and oceanic envelopes lies the inner solid globe. Reference has already been made to the comparative density of the planet among the other members of the solar system. In all speculation about the history of the earth, the density of the whole mass of the planet as compared with water—the standard to which the specific gravities of terrestrial bodies are referred—is a question of prime importance. Various methods have been employed for determining the earth's density. The deflection of the plumb-line on either side of a mountain of known structure and density, the time of oscillation of the pendulum at great heights, at the sea-level, and in deep mines, the comparative force of gravitation as measured by the torsion balance—each of these processes has been tried with the following various results:

Plumb-line experiments on Schiehallien (Maske-lyne and Playfair) gave as the mean density of the earth.....	4.713
Plumb-line experiments on Arthur's Seat, Edinburgh (James).....	5.316
Pendulum experiments on Mont Cenis (Carlini and Giulio).....	4.950
Pendulum experiments in Harton coal-pit, Newcastle (Airy).....	6.565
Torsion balance experiments (Gavendish).....	5.480
Torsion balance experiments (Baily).....	5.660

Though these observations are somewhat discrepant, we may feel satisfied that the globe has a mean density neither much more nor much less than 5.5; that is to say, it is five and a half times heavier than one of the same dimensions formed of pure water. Now the average density of the materials which compose the accessible portions of the earth is between 2.5 and 3; so that the mean density of the whole globe is about twice as much as that of its outer part. We might therefore infer that the inside consists of much heavier materials than the outside, and consequently that the mass of the planet must contain at least two dissimilar portions—an exterior lighter crust or rind, and an interior heavier nucleus. But the effect of pressure must necessarily increase the specific gravity of the interior as will be allowed to further on.

The Crust.—It was formerly a prevalent belief that the exterior and interior of the globe differed from each other to such an extent that, while the outer parts were cool and solid, the vastly more enormous inner part being intensely hot was more or less completely fluid. Hence the term "crust" was applied to the external rind in the usual sense of that word. This crust was variously computed to be ten, fifteen and twenty or more miles in thickness. For reasons which will be afterward given, the idea of internal liquification has been opposed by eminent physicists and is now abandoned by most geologists. The term "crust," however, continues to be used as a convenient word to denote the cool, upper, or outer layer of the earth's mass, accessible to human observation. It is in the structure and history of this crust that the main subjects of geological investigation are contained. Evidently our direct acquaintance with the chemical constitution of the globe must be limited to that of the crust, though by inference we may eventually reach highly probable conclusions regarding the constitution of the interior. Chemical research has discovered that sixty-four simple or as yet indecomposable bodies, called elements, in various proportions and compounds, constitute the accessible part of the crust. Of these, however, the great majority are comparatively of rare occurrence. The crust, so far as we can examine it, is mainly built up of about sixteen elements, which may be arranged in the two following groups, the most abundant bodies being placed first in each list:—

METALLOIDS.		METALS.	
	Atomic Weight.		Atomic Weight.
Oxygen.....	15.96	Aluminium.....	27.30
Silicon.....	28.00	Calcium.....	39.90
Carbon.....	11.97	Magnesium.....	23.94
Sulphur.....	31.98	Potassium.....	39.04
Hydrogen.....	1.00	Sodium.....	22.99
(really a metal)		Iron.....	55.90
Chlorine.....	35.37	Manganese.....	54.80
Phosphorus.....	30.96	Barium.....	136.80
Fluorine.....	19.10		

By far the most abundant and important of these elements is oxygen. It forms about 23 per cent. by weight of air, 83.88 per cent. of water, and about a half of all the rocks which compose the visible portion or "crust" of the globe. Another metalloid, silicon, comes next in abundance. It is always united with oxygen, forming the mineral silica which, either alone or in combination with various metallic bases as silicates, constitutes a half of all the known mass of the globe. Of the remaining metalloids carbon and sulphur sometimes occur in the free state, but usually in combination with oxygen or some base or metal. Chlorine and fluorine are found associated with metallic bases. Hydrogen is properly a metal, and occurs chiefly in combination with oxygen as the oxide, water. Phosphorus occurs with oxygen principally in phosphate of lime.

Of the metals by far the most important in the archi-

ecture of the exterior of the earth is aluminium. In conjunction with oxygen and silicon it forms the basis of most crystalline rocks. Calcium, magnesium, potassium, and sodium, combined with oxygen, enter largely into the composition of rocks. Iron is the great coloring material in nature, most of the yellow, brown, red, and green hues of rocks being due to some of its combinations. The sixteen elements mentioned in the foregoing lists form about ninety-nine parts of the earth's crust; the other elements constitute only about a hundredth part, though they include gold, silver, copper, tin, lead, and the other useful metals, iron excepted.

The Interior or Nucleus.—Though we cannot hope ever to have direct acquaintance with more than the mere outside skin of our planet, we may be led to infer the irregular distribution of materials within the crust from the present distribution of land and water, and the observed differences in the amount of deflection of the plumb-line near the sea and near mountain-chains. The fact that the southern hemisphere is almost wholly covered with water appears explicable only on the assumption of an excess of density in the mass of that portion of the planet. The existence of such a vast sheet of water as that of the Pacific Ocean is to be accounted for, says Archdeacon Pratt, by the presence of "some excess of matter in the solid parts of the earth between the Pacific Ocean and the earth's center, which retains the water in its place, otherwise the ocean would flow away to the other parts of the earth." The same writer points out that a deflection of the plumb-line toward the sea, which has in a number of cases been observed, indicates that "the density of the crust beneath the mountains must be less than that below the plains, and still less than that below the ocean bed." Apart therefore from the depressions of the earth's surface in which the oceans lie, we must regard the internal density, whether of crust or nucleus, to be somewhat irregularly arranged,—there being an excess of heavy materials in the water hemisphere and beneath the ocean-beds as compared with the continental masses.

In the evidence obtainable as to the former history of the earth, no fact is of more importance than the existence of a high temperature beneath the crust, which has now been placed beyond all doubt. This feature of the planet's organization is made clear by the following proofs:

Volcanoes.—In many regions of the earth's surface openings exist from which steam and hot vapors, ashes and streams of molten rock are from time to time emitted. The abundance of these openings seems inexplicable by any mere local causes, but must be regarded as indicative of a very high internal temperature. If to the still active vents of eruption we add those which have formerly been the channels of communication between the interior and the surface, there are probably few large regions of the globe where proofs of volcanic action cannot be found. Everywhere we meet with masses of molten rock which have risen from below as if from some general reservoir.

Hot Springs.—Where volcanic eruptions have ceased, evidence of a high internal temperature is still found to be found in springs of hot water, which continue for centuries to maintain their heat. Thermal springs, however, are not confined to volcanic districts. They sometimes rise even in regions many hundreds of miles distant from any active volcanic vent.

Borings, Wells and Mines.—The influence of the seasonal changes of temperature extends downward from the surface to a depth which varies according to latitude, to the thermal conductivity of the soils and rocks, and perhaps to other causes. The cold of winter

and the heat of summer may be regarded as following each other in successive waves downward, until they disappear along a limit at which the temperature remains constant. This zone of invariable temperature is believed to lie somewhere between sixty and eighty feet down in temperate regions. At Yakutsk in eastern Siberia (latitude 62° N.), however, the soil is permanently frozen to a depth of about 700 feet. In Java, on the other hand, a constant temperature is said to be met with at a depth of only two or three feet.

It is a remarkable fact, now verified by observation all over the world, that below the limit of the influence of ordinary seasonal changes the temperature, so far as we yet know, is nowhere found to diminish downward. It always rises; and its rate of increment never falls much below the average. The only exceptional cases occur under circumstances not difficult of explanation. On the one hand, the neighborhood of hot-springs, of large masses of lava, or of other manifestations of volcanic activity, may raise the subterranean temperature much above its normal condition; and this augmentation may not disappear for many thousand years after the volcanic activity has wholly ceased, since the cooling down of a subterranean mass of lava would necessarily be a very slow process. On the other hand, the spread of a thick mass of snow and ice over any considerable area of the earth's surface, and its continuance there for several thousand years, would so depress the subterranean isothermals that for many centuries afterward there might be a fall of temperature for a certain distance downward. At the present day, in at least the more northerly parts of the northern hemisphere, there are such evidences of a former more rigorous climate, as in the well sinking at Yakutsk already referred to. But beneath the limit to which the influence of the changes of the seasons extends, observations in most parts of the globe show that the temperature invariably rises as we penetrate toward the interior of the earth.

Probable Condition of the Earth's Interior.—Various theories (mostly fanciful) have been propounded on this subject. There are only three which merit serious consideration. (1) One of these supposes the planet to consist of a solid crust and a molten interior. (2) The second holds that, with the exception of local vesicular spaces, the globe is solid and rigid to the center. (3) The third contends that, while the mass of the globe is solid, there lies a liquid substratum beneath the crust.

1. The arguments in favor of internal liquidity may be summed up as follows. (a) The ascertained rise of temperature inward from the surface is such that, at a very moderate depth, the ordinary melting point of even the most refractory substances would be reached. At twenty miles the temperature, if it increases progressively, as it does in the depths accessible to observation, must be about $1,760^{\circ}$ Fahr.; at fifty miles it must be $4,600^{\circ}$, or far higher than the fusing-point even of so stubborn a metal as platinum, which melts at $3,080^{\circ}$ Fahr. (b) All over the world volcanoes exist from which steam and torrents of molten lava are from time to time erupted. Abundant as are the active volcanic vents, they form but a small proportion of the whole which have been in operation since early geological time. It has been inferred therefore that these numerous funnels of communication with the heated interior could not have existed and poured forth such a vast amount of molten rock, unless they drew their supplies from an immense internal molten nucleus. (c) When the products of volcanic action from different and widely-separated regions are compared and analyzed, they are found to exhibit a remarkable uniformity of character. (d) The abundant earthquake shocks which

affect large areas of the globe are maintained to be inexplicable unless on the supposition of the existence of a thin and somewhat flexible crust. These arguments, it will be observed, are only of the nature of inferences drawn from observations of the present constitution of the globe. They are based on geological data, and have been frequently urged by geologists as supporting the only view of the nature of the earth's interior compatible with geological evidence.

2. The arguments against the internal fluidity of the earth are based on physical and astronomical considerations of the greatest importance. They may be arranged as follows:

(a) Argument from precession and nutation.—The problem of the internal condition of the globe was attacked as far back as the year 1839 by the late Mr. Hopkins of Cambridge, who endeavored to calculate how far the planetary motions of precession and nutation would be influenced by the solidity or liquidity of the earth's interior. He found that the precessional and nutational movements could not possibly be as they are if the planet consisted of a central ocean of molten rock surrounded with a crust of twenty or thirty miles in thickness, that the least possible thickness of crust consistent with the existing movements was 800 to 1,000 miles, and that the whole might even be solid to the center, with the exception of comparatively small vesicular spaces filled with melted rock.

M. Delaunay, in a paper on *The Hypothesis of the Interior Fluidity of the Globe*, threw doubt on Hopkins' views, and suggested that, if the interior were a mass of sufficient viscosity, it might behave as if it were a solid, and thus the phenomenon of precession and nutation might not be affected. Sir William Thomson, who had already arrived at the conclusion that the interior of the globe must be solid, and acquiesced generally in Hopkins' conclusions, pointed out that M. Delaunay had not worked out the problem mathematically, otherwise he could not have failed to see that the hypothesis of a viscous and quasi-rigid interior "breaks down when tested by a simple calculation of the amount of tangential force required to give to any globular portion of the interior mass the precessional and nutational motions which, with other physical astronomers, he attributes to the earth as a whole." Sir William, in making this calculation, holds that it demonstrates the earth's crust down to depths of hundreds of kilometers to be capable of resisting such a tangential stress (amounting to nearly $\frac{1}{10}$ of a gramme weight per centimeter) as would with great rapidity draw out of shape any plastic substance which could properly be termed a viscous fluid. "An angular distortion of $8''$ is produced in a cube of glass by a distorting stress of about ten grammes weight per square centimeter. We may therefore safely conclude that the rigidity of the earth's interior substance could not be less than a millionth of the rigidity of glass without very sensibly augmenting the lunar nineteen-yearly nutation."

The assumption of a comparatively thin crust requires that the crust shall have such perfect rigidity as is possessed by no known substance. The tide-producing force of the moon and sun exerts such a strain upon the substance of the globe that it seems in the highest degree improbable that the planet could maintain its shape as it does unless the supposed crust were at least 2,000 or 2,500 miles in thickness. That the solid mass of the earth must yield to this strain is certain, though the amount of deformation is so slight as to have hitherto escaped all attempts to detect it. Had the rigidity been even that of glass or of steel, the deformation would probably have been by this time detected, and the actual phenomena of precession and nutation, as

well as of the tides, would then have been very sensibly diminished. The conclusion is thus reached that the mass of the earth "is on the whole more rigid certainly than a continuous solid globe of glass of the same diameter.

(b) *Argument from the tides.*—The phenomena of the oceanic tides are only explicable on the theory that the earth is either solid to the center, or possesses so thick a crust (2,500 miles or more) as to give to the planet practical solidity. Sir William Thomson remarks that, "were the crust of continuous steel, and 500 kilometers thick, it would yield very nearly as much as if it were india-rubber to the deforming influences of centrifugal force, and of the sun's and moon's attractions." It would yield, indeed, so freely to these attractions "that it would simply carry the waters of the ocean up and down with it, and there would be no sensible tidal rise and fall of water relatively to land.

(c) *Argument from relative densities of melted and solid rock.* The two preceding arguments must be considered decisive against the hypothesis of a thin shell or crust covering a nucleus of molten matter. It has been further urged, however, as an objection to this hypothesis, that cold solid rock is necessarily more dense than hot melted rock, and that even if a thin crust were formed over the central molten globe it would immediately break up and the fragments would sink toward the center. Undoubtedly this would happen were the material of the earth's mass of the same density throughout. But, as has been already pointed out, the specific gravity of the interior is at least twice as much as that of the visible parts of the crust. If this difference be due, not merely to the effect of pressure, but to the presence in the interior of intensely heated metallic substances, we cannot suppose that solidified portions of such rocks as granite and the various lavas could ever have sunk into the center of the earth, so as to build up there the honeycombed cavernous mass which might have served as a nucleus in the ultimate solidification of the whole planet. From the considerations above advanced we have seen that the earth's central mass may be plausibly conjectured to be metallic. Into this dense central mass the comparatively light crust could not sink, though its earliest formed portions would no doubt descend until they reached a stratum with specific gravity agreeing with their own, or until they were again melted.

Age of the Earth and Measures of Geological Time.—The age of our planet is a problem which may be attacked either from the geological or physical side.

1. The geological argument rests chiefly upon the observed rates at which geological changes are being effected at the present time, and is open to the obvious preliminary objection that it assumes the existing rate of change as the measure of past revolutions—an assumption which may be entirely erroneous, for the present may be a period when all geological events march forward more slowly than they used to do. The argument proceeds on data partly of a physical and partly of an organic kind. (a) The physical evidence is derived from such facts as the observed rates at which the surface of a country is being lowered by rain and streams, and new sedimentary deposits are formed. If we assume that the land has been worn away, and that stratified deposits have been laid down at the same rate as at present, then we must admit that the stratified portion of the crust of the earth must represent a very vast period of time. Doctor Croll puts this period at not less, but possibly much more, than sixty million years. (b) On the other hand, human experience, so far as it goes, warrants the belief that changes in the organic world proceed

with extreme slowness. Yet in the stratified rocks of the earth's crust we have abundant proof that the whole fauna and flora of the earth's surface have passed through numerous cycles of revolution—species, genera, families, appearing and disappearing many times in succession. On any supposition it must be admitted that these vicissitudes in the organic world can only have been effected with the lapse of vast periods of time, though no reliable standard seems to be available whereby these periods are to be measured. The argument from geological evidence is strongly in favor of an interval of probably not much less than one hundred million years since the earliest form of life appeared upon the earth, and the oldest stratified rocks began to be laid down.

2. The argument from physics as to the age of our planet is based by Sir William Thomson upon three kinds of evidence:—(1) the internal heat and rate of cooling of the earth; (2) the tidal retardation of the earth's rotation; and (3) the origin and age of the sun's heat.

(1) Sir William Thomson, applying Fourier's theory of thermal conductivity, pointed out some years ago (1862) that in the known rate of increase of temperature downward and beneath the surface, and the rate of loss of heat from the earth, we have a limit to the antiquity of the planet. He showed, from the data available at the time, that the superficial consolidation of the globe could not have occurred less than twenty million years ago, or the underground heat would have been greater than it is; nor more than four hundred million years ago, otherwise the underground temperature would have shown no sensible increase downward. He admitted that very wide limits were necessary. In more recently discussing the subject, he inclines rather toward the lower than the higher antiquity, but concludes that the limit, from a consideration of all the evidence, must be placed within some such period of past time as one hundred million of years.

(2) The argument from tidal retardation proceeds on the admitted fact that, owing to the friction of the tide-wave, the rotation of the earth is retarded, and is therefore much slower now than it must have been at one time. Sir William Thomson contends that had the globe become solid some ten thousand million years ago, or indeed any high antiquity beyond one hundred million years, the centrifugal force due to the more rapid rotation must have given the planet a very much greater polar flattening than it actually possesses. He admits, however, that, though one hundred million years ago that force must have been about three per cent. greater than now, yet "nothing we know regarding the figure of the earth and the disposition of land and water would justify us in saying that a body consolidated when there was more centrifugal force by three per cent. than now might not now be in all respects like the earth, so far as we know it at present." Professor Tait, in repeating this argument, concludes that, taken in connection with the previous one, "it probably reduced the possible period which can be allowed to geologists to something less than ten millions of years." He does not state, however, on what grounds he so reduces the available period, nor does he notice the objection urged by Dr. Croll that, granting the gradual submergence of the polar lands owing to the slackened speed of rotation, the subaerial denudation of the rising equatorial land might keep pace with the effects of the oceanic subsidence, so that we cannot infer from the present form of the earth what may have been its precise amount of polar compression at the time of solidification.

(3) The third argument, based upon the age of the

sun's heat, is confessedly less reliable than the two previous ones. It proceeds upon calculations as to the amount of heat which would be available by the falling together of masses from space, which gave rise by their impact to our sun. The vagueness of the data on which this argument rests may be inferred from the fact that in one passage Professor Tait places the limit of time during which the sun has been illuminating the earth as, "on the very highest computation, not more than about fifteen or twenty millions of years," while, in another sentence of the same volume, he admits that, "by calculations in which there is no possibility of large error, this hypothesis [of the origin of the sun's heat by the falling together of masses of matter] is thoroughly competent to explain one hundred millions of years solar radiation at the present rate, perhaps more." One hundred millions of years is probably amply sufficient for all the requirements of geology.

COMPOSITION OF THE EARTH'S CRUST.

The visible and accessible portion of the earth is formed of minerals and rocks. A mineral may be classified as an inorganic body distinguished by a more or less definite chemical composition, and usually a characteristic geometrical form. A rock is an aggregate mass, sometimes of one, more commonly of two or more minerals. Upward of 800 species of minerals and a vast number of varieties have been described. A very large proportion of these occur but rarely, and, though interesting and important to the mineralogist, do not demand the special attention of the geologist. While almost every mineral may be made to yield data of more or less geological significance, only those which enter into the composition of rock masses, or which are of frequent occurrence as accessories there, require to be familiarly known by the student of geology.

A rock may be defined as a mass of mineral matter, composed of one, more usually of several, kinds of mineral,—having, as a rule, no definite external form, and liable to vary considerably in chemical composition. The crust of the earth is built up of rocks, including under this term, not only hard solid masses like granite and limestone, but even all loose incoherent deposits such as mud, soil, peat and blown sand.

(1) *Structure*, or the manner in which the component particles have been built up into the mineral masses called rocks, is the fundamental character. Viewed broadly, there are two leading types of structure among rocks—crystalline or massive and fragmental.

A precise yet convenient classification of rocks is still required. We may adopt chemical characters as the basis of arrangement, and group rocks according as they may be sulphates, carbonates, silicates, etc.; but in so doing we place together rocks which, from a geological point of view, have no real affinity. Again, we may select mineralogical composition as the groundwork of the classification; but in this case also great violence may be done in the geological relationships of the rocks. In many respects the long established geological arrangement according to manner of production is a useful one—igneous, aqueous, and metamorphic rocks. There is, of course, the obvious objection to it that it starts upon a preconceived theory of the origin of the rocks, and this objection must be admitted to be serious. Every year, however, is diminishing its force by making us more certain of the mode of formation of different rocks; and, probably, some modification of it will in the end be very generally adopted.

DYNAMICAL GEOLOGY.

Under this section is included the investigation of those processes of change which are at present in

progress upon the earth, whereby modifications are made on the structure and composition of the crust, on the relations between the interior and the surface, as shown by volcanoes, earthquakes, and other terrestrial disturbances, on the distribution of oceans and continents, on the outlines of the land, on the form and depth of the sea bottom, on climate, and on the races of plants and animals by which the earth is tenanted. It brings before us, in short, the whole range of activities which it is the province of geology to study, and leads us to precise notions regarding their relations to each other, and the results which they achieve. A knowledge of this branch of the subject is thus the essential groundwork of a true and fruitful acquaintance with the principles of geology seeing that it necessitates a study of the present order of nature, and thus provides a key for the interpretation of the past.

The whole range of operations included within the scope of inquiry in this branch of the science may be regarded as a vast cycle of change, into which we may break at any point, and round which we may travel, only to find ourselves brought back to our starting-point. It is a matter of comparatively small moment at what part of the cycle we begin our inquiries. We shall always find that the changes we see in action have resulted from some that preceded, and give place to others which follow them.

At an early time in the earth's history, anterior to any of the periods of which a record remains in the visible rocks, the chief sources of geological action probably lay within the earth itself. The planet still retained a great store of its initial heat, and in all likelihood was the theater of great chemical changes, giving rise, perhaps, to manifestations of volcanic energy somewhat like those which have so marvelously roughened the surface of the moon. As the outer layers of the globe cooled, and the disturbances due to internal heat and chemical action became less marked, the influence of the sun, which must always have operated, would then stand out more clearly, giving rise to that wide circle of superficial changes wherein variations of temperature and the circulation of air and water over the surface of the earth come into play.

In the pursuit of his inquiries into the past history and into the present régime of the earth, the geologist must needs keep his mind ever open to the reception of evidence for kinds and especially for degrees of action which he had not before imagined. Human experience has been too short to allow him to assume that all the causes and modes of geological change have been definitively ascertained. On the earth itself there may remain for future discovery evidence of former operations by heat, magnetism, chemical change, or otherwise, which may explain many of the phenomena with which geology has to deal. Of the influences, so many and profound, which the sun exerts upon our planet, we can as yet only dimly perceive a little. Nor can we tell what other cosmical influences may have lent their aid in the evolution of geological changes.

In the present state of our knowledge, all the geological energy upon and within the earth must ultimately be traced back to our parent sun. There is, however, a certain propriety and convenience in distinguishing between that part of it which is due to the survival of some of the original energy of the planet, and that part which arises from the present supply of energy received day by day from the sun. In the former case we have to deal with the interior of the earth and its reaction upon the surface; in the latter we deal with the surface of the earth, and to some extent with its reaction on the interior. This distinction allows of a broad treatment of the subject under two divisions:

I. *Hypogene or Plutonic Action*—the changes within the earth caused by original internal heat and by chemical action.

II. *Epigene or Surface Action*—the changes produced on the superficial parts of the earth, chiefly by the circulation of air and water set in motion by the sun's heat.

HYPOGENE ACTION.

In the discussion of this branch of the subject we must carry in our minds the conception of a globe still intensely hot in its interior, radiating heat into space, and consequently contracting in bulk. Portions of molten rocks from inside are from time to time poured out at the surface. Sudden shocks are generated by which destructive earthquakes are propagated to and along the surface. Wide geographical areas are pushed up or allowed to sink down. In the midst of these movements very remarkable changes are produced upon the rocks of the crust: they are shattered, fractured, squeezed, crumpled, rendered crystalline, and even fused.

Volcanoes and Volcanic Action.

The term volcanic action (vulcanism or volcanicity) embraces all the phenomena connected with the expulsion of heated materials from the interior of the earth to the surface. Among these phenomena there are some of an evanescent character, while others leave permanent proofs of their existence. It is naturally to the latter that the geologist gives the chief attention, for it is by their means that he can trace the former phases of volcanic activity in regions where, for many ages, there have been no volcanic eruptions. In the operations of existing volcanoes he can observe only the superficial manifestations of volcanic action. But, examining the rocks of the earth's crust, he discovers that in the lapse of ages, amid the many terrestrial revolutions which geology reveals, the very roots of former volcanoes have been laid bare, displaying subterranean phases of vulcanism which could not be studied in any modern volcano. Hence an acquaintance only with active volcanoes will not give us a complete knowledge of volcanic action. It must be supplemented and enlarged by an investigation of the traces of former volcanoes preserved in the crust of the earth.

The openings by which the heated materials from the interior reach the surface include volcanoes (with their accompanying orifices), hot-springs and gas-springs. A volcano may be defined as a conical eminence, composed wholly or mainly of materials which have been ejected from below, and which have accumulated at the surface round the vent of eruption. As a rule it presents at its summit a cup-shaped cavity termed the crater, at the bottom of which is the top of the main funnel or pipe whereby the communication is maintained with the heated interior. A volcano, when of small size, may consist merely of one diminutive cone; when of the largest dimensions, it forms a huge mountain, with many subsidiary cones and many lateral fissures or pipes, from which the heated volcanic products are given out.

It is usual to class volcanoes as *active*, *dormant* and *extinct*. This arrangement, however, often presents considerable difficulty in its application. An active volcano cannot of course be mistaken, for even when not in actual eruption it shows, by its abundant evolution of steam and hot vapors, that it might break out into activity at any moment. But it is in many cases impossible to decide whether a volcano should be called extinct or only dormant.

The materials erupted from volcanic vents may be classed as (1) gases and vapors, (2) lavas, (3) fragmentary substances.

Volcanic action may be either constant or periodic.

Stromboli, in the Mediterranean, so far as we know, has been uninterruptedly emitting hot stones, steam and lava from the earliest period of history. Among the Moluccas the volcano Sioa, and in the Friendly Islands that of Tofua, have never ceased to be in eruption since their first discovery. The lofty cone of Sangay, among the Andes of Quito, is always giving off hot vapors; Cotopaxi, too, is constantly active. But, though examples of unceasing action may thus be cited from widely different quarters of the globe, they are nevertheless exceptional. The general rule is that a volcano breaks out from time to time with greater or less fury, and after longer or shorter intervals of quiescence.

To what particular cause or series of causes any special eruption may be due is a question to which at present no definite answer can be given. An attempt has been made to show that the explosions of a volcano are to some extent regulated by the conditions of atmospheric pressure over the area at the time. In the case of a volcanic funnel like Stromboli, where the expansive subterranean force within and the repressive effect of atmospheric pressure without just balance each other, any serious disturbance of that pressure might be expected to make itself evident by a change in the condition of the volcano. Accordingly, it has long been remarked by the fishermen of the Lipari Islands that in stormy weather there is at Stromboli a more copious discharge of steam and stones than in fine weather. They make use of the cone as a weather-glass, the increase of its activity indicating a falling, and the diminution a rising barometer.

The approach of an eruption is not always indicated by any premonitory symptoms, for many tremendous explosions are recorded to have taken place in different parts of the world without any perceptible warning. Much in this respect would appear to depend upon the condition of liquidity of the lava, and the amount of resistance offered by it to the passage of the escaping vapors through its mass.

The eruptions of Vesuvius are often preceded by a failure or diminution of the wells and springs in the district. But more frequent indications of an approaching outburst are conveyed by sympathetic movements of the ground beneath. Rumbles and groanings from a subterranean source are heard; slight tremors succeed, increasing in frequency and violence till they become distinct earthquake shocks. The vapors from the crater rise more abundantly into the air. All this time the lava column in the pipe or funnel of the volcano has been slowly ascending, forced upward and kept in perpetual agitation by the passage of the elastic vapors through its mass. If a long previous interval of quiescence has elapsed, there may be much solidified lava toward the top of the vent which will restrain the ascent of the still molten portion underneath. A vast pressure is thus exercised on the sides of the cone. Should these be too weak to resist, they will open in one or more rents, and the liquid lava will issue from the outer slope of the mountain; or the energies of the volcano will be directed toward clearing the obstruction in the chief throat, until, with tremendous explosions, and the rise of a vast cloud of dust and fragments, the bottom and sides of the crater are finally blown out, and the top of the cone disappears. The lava may now escape from the lowest part of the lip of the crater, while, at the same time, immense numbers of red-hot bombs, scorix, and stones are shot up into the air, most of them falling back into the crater, but many descending upon the outer slopes of the cone, and some even upon the country beyond the base of the mountain. The lava rushes down at first like one or more rivers of melted

iron, but, as it cools, its rate of motion lessens. Clouds of steam rise from its surface, as well as from the central crater. Indeed, every successive paroxysmal convulsion of the mountain is marked, even at a distance, by the rise of huge ball-like wreaths or clouds of steam, mixed with dust and stones, forming a vast column which towers sometimes a couple of miles above the summit of the cone. By degrees these diminish in frequency and intensity. The lava ceases to flow, the showers of stones and dust dwindle down, and after a time, which may vary from hours to days or months, even in the *régime* of the same mountain, the volcano becomes once more tranquil.

Let us now consider some of the aspects of this action which have more particular geological interests from the permanent changes with which they are connected, or from the way in which they enable us to detect and realize conditions of volcanic energy in former periods.

During the convulsions which culminate in the formation of a volcano, as well as in the subsequent progress of the mountain so formed, the ground at and around the focus of action is liable to be rent open by fissures. These tend to diverge from the focus; but around the vent where the rocks have been most exposed to concussion the fissures sometimes intersect each other in all directions.

Two obvious causes may be assigned for the production of fissures:—(1) the enormous expansive force of the imprisoned vapors acting upon the walls of the funnel and convulsing the cone by successive explosions; and (2) the hydrostatic pressure of the lava-column in the funnel, amounting to about 125 pounds per square inch, or eight tons on the square foot, for each 100 feet of depth. Both of these causes may act simultaneously.

Into the rents thus formed the molten lava naturally finds its way. It is indeed forced into them, and solidifies there like iron in a mold. The cliffs of many an old crater show how marvelously they have been ejected by such *veins* or *dykes* of lava. The dykes project now from the softer tuffs like great walls of masonry. Such wedges of solid rock driven into the cone must widen its dimensions, and at the same time from their length and ramifications must bind the substance of the cone together, and thus strengthen it against the effects of future convulsions. We can understand, therefore, how there should be for a time an alternation in the character of the eruptions of a volcano, depending in great measure upon the relations between the height of the cone on the one hand and the strength of its sides on the other. When the sides have been well-braced together by interlacing dykes, and further thickened by the spread of volcanic materials all over their slopes, they may resist the effects of explosion and of the pressure of the ascending lava-column. In this case the volcano may find relief only from its summit, and if the lava flows forth it will do so from the top of the cone. As the cone increases in elevation, however, the pressure from within upon its sides augments. Eventually egress is once more established on the flanks by means of fissures, and a new series of lava-streams is poured out over the lower slopes.

Though lava very commonly issues from the lateral fissures on a volcanic cone, it may sometimes approach the surface without actually flowing out. Again, it frequently happens that minor volcanic cones are thrown up on the line of a fissure. This may arise either from the congelation of the lava round the point of emission, or from the accumulation of ejected scorice round the fissure-vent. Of the former structure examples occur in Hawaii, where the lava is remarkably liquid, and rapidly hardens into tears or drops, like wax down the sides of a candle. Where in viscid lavas the steam tears off

and throws up many scorice and bombs, a cone of such loose materials will naturally form round the orifice by which the lava escapes from the flank of the mountain.

Although volcanic materials may be erupted to a large extent without the appearance of visible fissures, they cannot in such cases reach the surface without some explosive action, and the consequent displacement and removal of previously existing rock. Vents are thus blown out of the solid crust, the volcanic energy being, as it were, concentrated on a given point, which we may suppose must usually be the weakest in the structure of that part of the crust. The operation has often been observed in volcanoes already formed, and has even been witnessed on ground previously unoccupied by a volcanic vent. The history of the cone of Vesuvius brings before us a long series of such explosions, beginning with that of 79—the greatest which has occurred within the times of human history—and coming down to the present day.

A communication having been opened, either by fissuring or explosion between the heated interior and the surface, fragmentary materials seldom fail to be ejected from it. These may consist at first mainly of the rocks through which the orifice has been opened, as has just been explained. But if eruptive energy continues, they soon appear in larger quantities, and consist of thoroughly volcanic substances. In a great eruption vast numbers of red-hot stones are shot up into the air, and fall back partly into the crater and partly on the outer slopes of the cone. But instances are known where large stones, ejected obliquely, have described huge parabolic curves in the air, and fallen at a great distance. Stones eight pounds in weight occur among the ashes which buried Pompeii. The volcano of Antuco in Chili is said to send stones flying to a distance of thirty-six miles, and Cotopaxi is reported to have hurled a two-hundred-ton block nine miles.

But in many great eruptions, besides a constant shower of stones and scorice, a vast column of exceedingly fine dust rises out of the crater, sometimes to a height of more than a mile, and then spreads outward like a sheet of cloud. So dense sometimes is this dust-cloud that the sun is obscured, and for days together the darkness of night reigns for miles around the volcano. Probably the most stupendous outpouring of volcanic ashes on record was that which took place, after a quiescence of twenty-six years, from the volcano Coseguina, in Nicaragua, during the early part of the year 1835. On that occasion utter darkness prevailed over a circle of thirty-five miles radius, the ashes falling so thickly that, even eight leagues from the mountain, they covered the ground to a depth of about ten feet. It was estimated that the rain of dust and sand fell over an area at least 270 geographical miles in diameter. Some of the finer materials, thrown so high as to come within the influence of an upper air-current, were borne away eastward, and fell four days afterward at Kingston, in Jamaica—a distance of 700 miles.

An inquiry into the origin of these showers of fragmentary materials brings vividly before us some of the essential features of volcanic action. We find that bombs, slags and lapilli may be thrown up in comparatively tranquil states of a volcano, but that the showers of fine dust are discharged with violence, and only appear when the volcano becomes more energetic. Thus, at the constantly, but quietly, active volcano of Stromboli, the column of lava in the pipe may be watched slowly rising and falling with a slow rythmical movement. At every rise the surface of the lava swells up into blisters several feet in diameter, which by and by burst with a

sharp explosion that makes the walls of the crater vibrate. A cloud of steam rushes out, carrying with it hundreds of fragments of the glowing lava, sometimes to a height of 1,200 feet. It is by the ascent of steam through its mass that a column of lava is kept boiling at the bottom of a crater, and by the explosion of successive larger bubbles of steam that the various bombs, slags, and fragments of lava are torn off and tossed into the air. It has often been noticed at Vesuvius that, after each great concussion, a huge ball-like cloud of steam rushes up from the crater. Doubtless it is the sudden escape of that steam which causes the explosion. The violence of the explosion will depend greatly upon the viscosity of the lava, and the consequent resistance offered to the upward passage of the steam. Explosions and accompanying scoriæ are abundant at Vesuvius, where the lavas are comparatively viscid; they are almost unknown at Kilauea, where the lava is remarkably liquid.

Evidently no part of the operations of a volcano has greater geological significance than the ejection of such enormous quantities of fragmentary matter. In the first place, the fall of these loose materials round the orifice of discharge is one main cause of the growth of the volcanic cone. The heavier fragments gather round the vent, and there too the thickest accumulation of finer dust takes place. Hence, though successive explosions may blow out the upper part of the crater-walls, and prevent the mountain from growing so rapidly in height, every eruption must add to the diameter of the cone. In the second place, as every shower of dust and sand adds to the height of the ground on which it falls, thick volcanic accumulations may be formed far beyond the base of the mountain. In these are entombed trees and other kinds of vegetation, together with the bodies of many animals, as well as the works of man. Hence new geological formations arise which, in their component materials, not only bear witness to the volcanic eruptions which produced them, but preserve a record of the land-surfaces over which they spread. In the third place, besides the distance to which the fragments may be hurled by volcanic explosions, or to which they may be diffused by the ordinary aerial movements, we have to take into account the vast spaces across which the finer dust is sometimes borne by upper currents in the atmosphere. An instance has already been cited where ashes from Coseguina fell 700 miles away, having been carried all that long distance by a high counter-current of air, moving apparently at the rate of about seven miles an hour in an opposite direction to that of the wind which blew at the surface.

A microscopic examination of their intimate structure shows that the lavas have been truly molten rocks. They usually consist fundamentally of a glass through which are diffused, in greater or less abundance, various microlites and crystals. Their degree of liquidity, at the time of emission, seems to depend on the extent to which the rock remains in the condition of glass, viscosity increasing with the development of the microlites and crystals out of the glassy menstruum in which, no doubt, originally their component molecules were diffused. The fluidity may also be governed in no small degree by the amount of vapor existing interstitially in the molten mass. But even where the lava pours forth with a liquidity like that of melted iron, it speedily assumes a more viscid motion, as the process of devitrification advances and the rock is exposed to the chilling effects of radiation and of contact with air and soil. An interesting fact, admirably shown by the microscope, but often easily observable with the naked eye, is that in lava still liquid and mobile well-defined crystals make their appearance. These sometimes are broken during the

continued movement of the surrounding mass, the separated fragments becoming involved in the general glassy base or portions of that base, are injected into the fractures of the crystals.

It was at one time supposed that lava beds could not consolidate on such steep slopes as those of most volcanoes, and that their present inclined position was to be attributed to a central upheaval of each mountain. This idea formed the subject of the famous theory of elevation-craters of L. von Buch, E. de Beaumont, and other geologists. It was a matter of prime importance in the interpretation of volcanic action to have this question settled. To Constant Prevost belongs the merit of having completely exposed the fallacy of this theory. He pointed out that there was no more reason why lavas should not consolidate on steep slopes than that tears or drops of wax should not do so. Mr. Poulett Scrope also showed conclusively that the steep slope of the lava-beds of a volcanic cone was original. Sir Charles Lyell and Mr. Hartung subsequently obtained abundant additional evidence from the Canary Islands, Etna, and other volcanic districts, to disprove the elevation theory. Geologists are now agreed that thick sheets of lava, with all their characteristic features, can consolidate on slopes of even 35° and 40° .

At its first appearance, where it issues from the mountain, the lava glows with a white heat, and flows with a motion which has been compared to that of honey or of melted iron. It soon becomes red, and, like a coal fallen from a hot fireplace, rapidly grows dull as it moves along, until it assumes a black, cindery aspect. At the same time the surface congeals, and soon becomes solid enough to support a heavy block of stone. A large area which has been flooded with lava is perhaps the most hideous and appalling scene of desolation anywhere to be found on the surface of the globe.

As a rule a lava-stream shows three component layers. At its bottom lies a rough, slaggy mass, produced by the rapid cooling of the lava, and the breaking up and continued onward motion of the scoriform layer. The central and main portion of the stream consists of solid lava, often, however, with a more or less curious and vesicular texture. The upper part, as we have seen, is a mass of rough broken-up slags, scoriæ, or clinkers. The proportions borne by these respective layers to each other vary continually.

The hardened crust of a lava-stream is a bad conductor of heat. Consequently, when the surface of the mass has become cool enough to be walked upon, the red hot mass may be observed through the rents to lie only a few inches below. Many years therefore may elapse before the temperature of the whole mass has fallen to that of the surrounding soil.

This extremely slow rate of cooling has justly been regarded as a point of high geological significance in regard to the secular cooling and probable internal temperature of our globe. Some geologists have argued indeed that, if so comparatively small a portion of molten matter as a lava-stream can maintain a high temperature under a thin, cold crust for so many years, we may, from analogy, feel little hesitation in believing that the enormously vaster mass of the globe may, beneath its relatively thin crust, still continue in a molten condition within. More legitimate deductions, however, might be drawn, if we knew more accurately and precisely in each case the rate of loss of heat, and how it varies in different lava-streams.

In its descent a stream of lava may reach a water-course, and, by throwing itself as a great embankment across the stream, may pond back the water and form a lake. Such is the origin of picturesque lake Adiat in

Anvergne. Or the molten current may usurp the channel of the stream, and completely bury the whole valley, as has happened again and again among the vast lava-fields of Iceland. No change in physiography is so rapid and so permanent as this. The channel which has required, doubtless, many thousand of years for the water laboriously to excavate, is scaled up in a few hours under one hundred feet or more of stone, and a still longer interval may elapse before this newer pile is similarly eroded.

In passing from a fluid to a solid condition, and thus contracting, lava acquires different structures. The most characteristic structure among volcanic rocks is the prismatic, or, as it is incorrectly termed, "basaltic." Where this arrangement occurs, as it does so commonly in basalt, the mass is divided into tolerably regular pentagonal, hexagonal, or irregularly polygonal prisms or columns, set close together at a right angle to the main cooling surfaces. These prisms vary from two or three to eighteen or more inches in diameter, and range up to one hundred or even one hundred and fifty feet in length.

By the outpouring of lava two important kinds of geological change are produced. In the first place, the surface of a country is thereby materially changed. Stream-courses, lakes, ravines, valleys, in short all the minor features of a landscape, may be completely overwhelmed under a sheet of lava, one hundred feet or more in thickness. The drainage of the district is thus effectually altered, and all the numerous changes which flow from the operations of running water over the land are arrested and made to begin again in new channels. In the second place, considerable alterations may likewise be caused by the effects of the heat and vapors of the lava upon the subjacent or contiguous ground. Instances have been observed in which the lava has actually melted down opposing rocks, or masses of slags, on its own surface.

But, on the other hand, the exceedingly trifling change produced even by a massive sheet of lava has often been remarked with astonishment.

We have seen that large quantities of water accompany many volcanic eruptions. In some cases, where ancient crater-lakes or internal reservoirs have been shaken by repeated detonations, and finally disrupted, the mud which has thus been produced issues at once from the mountain. Such "mud-lavas," on account of their fluidity and swiftness of motion, are more dreaded for their destructiveness than even the true melted lavas. On the other hand, rain or melted snow, rushing down the cone and taking up loose volcanic dust, is converted into a kind of mud that grows more and more pasty as it descends. The mere sudden rush of such large bodies of water down the steep declivity of a volcanic cone cannot fail to effect much geological change. Deep trenches are cut out of the loose volcanic slopes, and sometimes large areas of woodland are swept away, the debris being strewn over the plains below.

Between the destructive effects of mere water-torrents and that of these mud-floods there is, of course, the notable difference that, whereas in the former case a portion of the surface is swept away, in the latter, while sometimes considerable demolition of the surface takes place at first, the main result is the burying of the ground under a new tumultuous deposit by which the surface is greatly changed, not only as regards its temporary aspect, but in its more permanent features, such as the position and form of its water-courses.

Though probably seldom if ever volcanic in the proper sense of that term, certain remarkable orifices of eruption may be noticed here to which the names of mud-volcanoes, salses, air-volcanoes and macalubas have

been applied. These are conical hills formed by the accumulation of fine and usually saline mud, which, with various gases, is continuously or intermittently given out from the orifice or crater in the center. They occur in groups, each hillock being sometimes less than a yard in height, but ranging up to elevations of 100 feet, or even sometimes, as in the plains of the lower Indus, to 400 feet. Like true volcanoes, they have their periods of repose, when either no discharge takes place at all, or mud oozes out tranquilly from the crater, and their epochs of activity, when large volumes of gas, and sometimes columns of flame, rush out with considerable violence and explosion, and throw up mud and stones to a height of several hundred feet.

The gases play much the same part therefore in these phenomena that steam does in those of true volcanoes. They consist of carbonic acid gas, carbureted hydrogen, sulphureted hydrogen, and nitrogen. The mud is usually cold. In the water occur various saline ingredients, among which common salt generally appears. Naphtha is likewise frequently present. Large pieces of stone, differing from those in the neighborhood, have been observed among the ejections, indicative doubtless of a somewhat deeper source than in ordinary cases. Heavy rains may wash down the minor mud cones and spread out the material over the ground, but gas-bubbles again appear through the sheet of mud, and by degrees a new series of mounds is once more thrown up.

There can be little doubt that these phenomena are to be traced to chemical changes in progress underneath. Doctor Daubeny explained them in Sicily by the slow combustion of beds of sulphur. The frequent occurrence of naphtha and of inflammable gas points, in other cases, to the disengagement of hydrocarbons from subterranean strata.

Some gaseous discharges belong to true volcanic phenomena, others are closely associated with the mud-volcanoes. To the former class we may assign the copious emanations of carbonic acid which so frequently take place in districts where volcanic activity has been long dormant or extinct. The gas either comes out directly from fissures of the rock, or rises dissolved in the water of springs. The old volcanic districts of Europe furnish many examples. Thus on the shores of the Laacher See—an ancient crater lake of the Eifel—carbonic acid gas issues from numerous openings called *moiffette*, round which dead insects, and occasionally mice and birds may be found. In the same region a hundred of springs more or less charged with the gas. The famous Valley of Death in Java contains one of the most remarkable gas-springs in the world. It is a deep, bosky hollow, from one small space on the bottom of which carbonic acid issues so copiously as to form the lower stratum of the atmosphere. Tigers, deer, and wild-boar, enticed by the shelter of the spot, descend and are speedily suffocated. Many of their skeletons, together with those of man himself, have been observed.

In the second class of gas-springs we may group the emanations of carbureted hydrogen, which, when they take fire, are known as fire-wells. They occur in many of the districts where mud-volcanoes appear, as in northern Italy, on the Caspian, in Mesopotamia, in southern Kurdistan, and in many parts of the United States. It has been observed that they rise especially in regions where beds of rock-salt lie underneath, and as that rock has been ascertained often to contain compressed carbureted hydrogen, the solution of the rock by subterranean water, and the consequent liberation of the gas, has been offered as an explanation of these fire-wells.

In various regions where volcanic action still contin-

ues, or where it has long been dormant, there occur eruptive fountains of hot water and steam, to which the general name of geysers is given, from the well-known examples in Iceland, which were the first to be seen and described. Besides the Great and Little Geysers, the Strokkr, and other minor springs of hot water in Iceland, other, perhaps still more striking, examples have been brought to light in that tract of the Western Territories of the United States set aside as the "Yellowstone National Park," and good illustrations are also found in New Zealand. A geyser possesses a vertical pipe in the ground, terminating at the surface in a basin which is formed of siliceous sinter, and may rise some feet or yards above the general level. At more or less regular intervals rumblings and sharp detonations occur underneath, followed by an agitation of the water in the basin, and then by the violent expulsion of a column of water and steam to a considerable height in the air. The hot water contains silica in solution, which, on cooling and evaporating, is deposited at the surface; and thus the geyser builds up its basin, sometimes raising it into a long, solitary, finger-like pillar.

It is not only on the surface of the land that volcanic action shows itself. It takes place likewise under the sea, and as the geological records of the earth's past history are chiefly marine formations, the characteristics of submarine volcanic action have no small interest to the geologist. Unfortunately, the phenomena of recent volcanic eruptions under the sea are for the most part inaccessible.

(1) Volcanoes occur along the margins of the ocean basins, particularly along lines of dominant mountain ranges. The vast hollow of the Pacific is girdled with a wide ring of volcanic foci. (2) They rise as a striking feature in the heart of the ocean basins. Most of the oceanic islands are volcanic. Even the coral islands have in all likelihood been built upon the tops of submarine volcanic cones. (3) Volcanoes are thus situated, as a rule, close to the sea. When they occur inland they sometimes appear in the neighborhood of a large sheet of water. Yet so many instances have been observed where volcanoes have appeared at great distances from any sheet of water that the proximity of a lake or of the sea cannot be regarded as necessary for the evolution of volcanic phenomena.

Besides the existence of what are called extinct volcanoes, the geologist can adduce proofs of the former presence of active volcanoes in many countries where cones and craters and all ordinary aspects of volcanic mountains have long disappeared. Sheets of lava, beds of tuff, dykes, and necks representing the sites of volcanic vents have been recognized abundantly. These manifestations of volcanic action, moreover, have as wide a range in geological time as they have in geological area. Every great geological period, back at least as far as the Lower Silurian, has had its volcanoes.

It can be shown that, within the same comparatively limited geographical space, volcanic action has been rife at intervals during a long succession of geological ages. The existing active volcanoes of Iceland rise from amid Tertiary lavas and tuffs, which form part of a great volcanic ridge, extending down through the Farøe Islands into the west of Britain. Volcanic action, which now manifests itself so conspicuously along certain lines, seems to have continued in that linear development for protracted periods of time. The actual vents have changed, dying in one place and breaking out in another, yet keeping on the whole along the same lines.

Volcanoes depend, of course, upon the internal heat of the planet as their prime source of energy. But the *modus operandi* whereby that internal heat manifests itself in volcanic action is a problem by no means of easy

solution. Were this action merely an expression of the intensity of the heat, we might expect it to have manifested itself in a far more powerful manner in former periods, and to exhibit a regularity and continuity commensurate with the exceedingly slow diminution of the earth's temperature. But there is no geological evidence in favor of greater volcanic intensity in ancient times than in more recent periods; on the contrary, it may be doubted whether any of the Palæozoic volcanoes equalled in magnitude those of the Tertiary period, or whether any of the latter ever produced such stupendous changes as have been effected by modern volcanoes still active. On the other hand, no feature of volcanic action is more conspicuous than its spasmodic fitfulness.

The mere presence of a high internal temperature, therefore, would probably not of itself produce the phenomena of volcanoes, at least in the present condition of the planet. There can be no doubt that one essential exciting cause of volcanic action is the descent of water from the surface. It has already been pointed out how invariably steam plays a chief part in volcanic eruptions, how it issues in vast clouds from the crater, and continues to rise copiously from the lava even after the molten rock has traveled for some miles, and has assumed a solid surface. The quantity of water which descends into the interior must be enormous. The floor of the sea, the beds of rivers and lakes, are all leaky. Of the annual rain which sinks beneath the surface of the land, we cannot tell what proportion is detained and prevented from rising again in springs. Not only does this subterranean water percolate down cracks and joints, it infiltrates through the very pores of the rocks, and can do so even against the pressure of steam on the further side.

Accordingly, there has arisen a very prevalent belief among geologists, that it is to the enormous expansive force of perhaps white-hot water finding access to, and imprisoned in, some of the heated empty spaces at the roots of volcanoes that the explosions of a crater and the subsequent rise of a lava-column are due. It has been supposed that, somewhat like the reservoirs in which the hot water and steam accumulate under the Icelandic geysers, these volcanic spaces receive a constant influx of water from the surface, which cannot escape by other channels, but is in great part converted into vapor or retained in the fluid state at an enormously high temperature and under vast pressure. In the course of time, the materials filling up the chimney are unable to withstand the upward expansion of this imprisoned vapor and water, so that, after some premonitory rumblings, the whole opposing mass is blown out, and the vapor rushes up in the well-known masses of cloud. Meanwhile, the removal of the overlying column relieves some of the pressure from the water-charged lava, which therefore begins to rise in the funnel until it forces its way through some weak part of the cone, or pours over the top of the crater. After a time the vapor is expended, the energy of the volcano ceases, and there comes a variable period of repose, until a renewal of the same phenomena brings on another eruption. By such successive paroxysms it is supposed that the form of the internal reservoirs and tunnels become changed; new spaces for the accumulation of superheated water are formed, whence in time new volcanic vents issue, while the old ones gradually die out.

As physical considerations negative the idea of a comparatively thin crust surmounting a molten interior whence volcanic energy might be derived, geologists have found themselves involved in great perplexity to explain volcanic phenomena for the production of which a source of no great depth would seem to be

necessary. They have supposed the existence of pools or lakes of liquid lava lying beneath the crust, and at an inconsiderable depth from the surface. They have sometimes appealed to the influence of the contraction of the earth's mass, assuming that the contraction is greater in the outer than in the inner portions, and that the effect of this must be to squeeze out some of the internal molten matter through weak parts of the crust.

Earthquakes.

The phenomena of earthquake-motion have been discussed in the article EARTHQUAKES. Only those which have a marked geological importance from the way in which they affect the crust or surface of the earth will be noticed here.

Secular Upheaval and Depression.

Besides the sudden movements due to earthquake-shocks, the crust of the earth undergoes in many places oscillations of an extremely quiet and uniform character, sometimes of an elevatory, sometimes of a subsiding nature. So tranquil are these changes that they produce from day to day no appreciable alteration in the aspect of the ground affected. Only after the lapse of several generations, and by means of careful measurements, can they really be proved. Indeed, in the interior of a country nothing but a series of accurate levelings from some unchanged datum-line might detect the change of level, unless the effects of this terrestrial movement showed themselves in altering the drainage. It is only along the sea-coast that a ready measure is afforded of any such movement. In popular language it is usual to speak of the sea as rising or sinking relatively to the land. But so long as the volume of the ocean remains the same, the general sea-level can neither rise nor fall, unless by some movement of the solid globe underneath it. And, as we cannot conceive of any possible augmentation of the oceanic waters, nor of any diminution save what may be due to the extremely slow process of abstraction by the hydration of minerals, or absorption into the earth's interior, we are compelled to regard the sea-level as practically a constant datum-line, any deviation from which, in the apparent heights of sea and land, must be due to movement of the land and not of the sea.

Movements of Upheaval.—Various maritime tracts of the land have been ascertained to have undergone in recent times, or to be still undergoing, a gradual elevation above the sea. Thus, the coast of Siberia, for 600 miles to the east of the river Lena, the western tracts of South America, and the Scandinavian peninsula, with the exception of a small area at its southern apex, have been proved to have been recently upheaved. The proofs of this change of level chiefly to be relied on are the following:

The position of rocks covered with barnacles or other littoral adherent animals, or pierced by lithodomous shells. A single stone with these creatures on its surface would not necessarily prove anything, for it might be cast up by a storm; but a line of large boulders, which had evidently not been moved since the cirripedes and mollusks lived upon them, and still more a solid cliff with these marks of littoral or sub-littoral life upon its base, now raised above high-water mark, would be sufficient to demonstrate a rise of land. The amount of the upheaval might be pretty accurately determined by measuring the vertical distance between the upper edge of the barnacle zone upon the upraised rock, and the limit of the same zone on the present shore.

A line of sea-caves, now standing at a distance above high water-mark beyond the reach of the sea, would afford evidence of recent uprise, since caves of this kind

are only hollowed out by the waves between tide-marks.

One of the most striking proofs of upheaval is furnished by what are termed *raised beaches*. A beach is the space between the tide-marks, where the sea is constantly busy producing sand and gravel, mingling with them the remains of shells and other organisms, sometimes piling the deposits up, sometimes sweeping them away out into the open water. The terrace or platform thus formed is a well-marked feature of coast-lines skirting tidal seas. When the land rises with sufficient rapidity to carry up the line of littoral deposits above the reach of the waves, the flat terrace thus elevated is known as a raised beach. The former high-water mark then lies inland, and while its sea-worn caves are in time hung with ferns and mosses, it furnishes itself an admirable platform, on which meadows, fields, and gardens, roads, houses, villages, and towns spring up, while a new beach is made below the margin of the uplifted one. Raised beaches abound around many parts of the coast-line of Britain. Some excellent examples occur in Cornwall and Devon. The coast-line on both sides of Scotland is fringed with raised beaches, sometimes four or five occurring above each other, at heights of twenty-five, forty, sixty, seventy-five and one hundred feet above the present high-water mark. Each terrace marks a former lower level of the land with regard to the sea, and probably a lengthened stay of the land at that level, while the intervals between them represent the vertical amount of each successive uplift of the land, and show that the land in its upward movement did not remain long enough at intermediate points for the formation of terraces. A succession of raised beaches, rising above the present sea-level, may therefore be taken as pointing to a former prolonged upheaval of the country, interrupted by long pauses, during which the general level did not materially change.

Any stratum of rock containing marine organisms, which have manifestly lived and died where their remains now lie, must be held to prove upheaval of the land.

In countries which have been long settled by a human population, it is sometimes possible to prove, or at least to render probable, the fact of recent uprise of the land by reference to tradition, to local names, and to works of human construction.

Movements of Subsidence.—It is more difficult to trace the downward movement of the land, for the evidence of each successive sea-margin is carried down and washed away or covered up. Nevertheless, the fact of subsidence can be satisfactorily established by the following proof:

The results of mere erosion by the sea and those of actual depression of the land cannot always be distinguished without some care. The encroachment of the sea upon the land, involving, it may be, the disappearance of successive fields, roads, houses, villages, and even whole districts, does not necessarily indicate a sinking of the land. Such destruction of the coast-line may, indeed, be in progress without any actual change of level. Should the sea, however, rise to the level of roads and buildings which it never used to touch, should former half-tide rocks cease to show even at low water, and should rocks, previously above the reach of the highest tide, be turned first into shore reefs, then into skerries and islets, we infer that the coast-line is sinking. Such kind of evidence is found in Scania, the most southerly part of Sweden. Streets, built of course above high-water mark, now lie below it, with older streets lying beneath them, so that the subsidence is of some antiquity. A stone, the position of which had

been exactly determined by Linnæus in 1749, was found after eighty-seven years to be one hundred feet nearer the water's edge. The west coast of Greenland, for a space of more than six hundred miles, is perceptibly sinking. It has there been noticed that, over ancient buildings on low shores, as well as over entire islets, the sea has risen. The Moravian settlers have been more than once driven to shift their boat-poles inland, some of the old poles remaining visible under water.

These movements, without question, we must again trace back to consequences of the original internal heat of the earth. There are various ways in which the heat may have acted. Thus a considerable accession of heat causes them to contract. We may suppose, therefore, that, during the subterranean changes, a great extent of the crust underneath a tract of land may have its temperature slowly raised. The effect of this increment would be to cause a slow uprise of the ground above. The gradual transference of the heat to another quarter might produce a steady subsidence. Such variations in subterranean temperature, however, could give rise at the most to but very insignificant elevations or depressions.

A far more important and generally effective cause is to be sought in the secular contraction of the globe. If our planet has been steadily losing heat by radiation into space, it must have progressively diminished in volume. The cooling implies contraction. According to Mr. Mallet, the diameter of the earth is less by at least 180 miles since the time when the planet was a mass of liquid. But the contraction has not manifested itself uniformly over the whole surface of the planet. The crust varies much in structure, in thermal resistance, and in the position of its isogeothermal lines. As the hotter nucleus contracts more rapidly by cooling than the cooled and hardened crust, the latter must sink down by its own weight, and in so doing requires to accommodate itself to a continually diminishing diameter. The descent of the crust gives rise to enormous tangential pressures. The rocks are crushed, crumbled and broken in many places. Subsidence must have been the general rule, but every subsidence would doubtless be accompanied with upheavals of a more limited kind. The direction of these upheaved tracts would largely depend upon the original structure of the crust. It would be apt to occur in lines which, once taken as lines of weakness or relief from the intense strain, would probably be made use of again and again at successive paroxysms or more tranquil periods of contraction. Mr. Mallet has ingeniously connected these movements with the linear direction of mountain chains, volcanic vents and earthquake shocks.

Hypogene Causes of Changes in the Texture, Structure and Composition of Rocks.

The phenomena of hypogene action hitherto under consideration have related almost wholly to the effects produced at the surface. It is evident, however, that these phenomena must be accompanied by very considerable changes in the rocks which form the earth's outer crust. These rocks, as just stated, have been subjected to enormous pressure; they have been contorted, crumpled, and folded back upon themselves, as if thousands of feet of solid limestones, sandstones and shales had been merely a few layers of carpet; they have been shattered and fractured everywhere; they have in one place been pushed far above their original position, in another depressed far beneath it: so great has been the compression which they have undergone that their component particles have in many places been rearranged, and even crystallized. They have here and there actually been

reduced to fusion, and have been abundantly invaded by masses of molten rock from below.

It is evident that we can hardly hope to detect many of these processes of subterranean change actually in progress and watch their effects. The very vastness of some of them places them beyond our direct reach, and we can only reason regarding them from the changes which we see them to have produced. But a good number are of a kind which we can in some measure imitate in our laboratories and furnaces. It is not requisite, therefore, to speculate wholly in the dark on this subject. Since the original and classic researches of Sir James Hall, the founder of experimental geology, great progress has been made in the investigation of hypogene processes by experiment. The conditions of nature have been imitated as closely as possible, and varied in different ways, with the result of giving us an increasingly clear insight into the physics and chemistry of subterranean geological changes.

STRUCTURAL GEOLOGY.

OR THE ARCHITECTURE OF THE EARTH'S CRUST.

Since by far the largest portion of the crust consists of sedimentary or aqueous rocks, it will be of advantage to treat of them first, noting, in the first place, their original characters as resulting from the circumstances under which they were formed, and afterward, the modifications subsequently effected upon them. Many of these superinduced structures, which are not peculiar to sedimentary, but occur more or less markedly in all rocks, may be conveniently described together. The distinctive characters of the igneous or eruptive rocks, as portions of the architecture of the crust, will then be described; and lastly, those of the crystalline schists and other associated rocks to which the name of metamorphic is usually applied.

The term "stratified," so often applied as a general designation to the aqueous or sedimentary rocks, expresses their leading structural feature. They are arranged in layers or strata, an arrangement characteristic of them alike in hand-specimens and in the cliffs of mountains. Not that every morsel of aqueous rock exhibits evidence of stratification. But it is this characteristic which is least frequently absent. The general aspects of stratification will be best followed in an explanation of the terms by which they are expressed.

Laminae are the thinnest paper-like layers of deposit in a stratified rock. Such fine layers only occur where the material is fine-grained, as in mud or shale, or where fine scales of some mineral have been plentifully deposited, as in micaceous sandstone. In some laminated rocks the laminae cohere so firmly that they can hardly be split open, and the rock will break more readily across them than in their direction. More usually, however, the planes of lamination serve as convenient divisional planes by means of which the rock can be split open. The frequency with which laminae can be separated from each other, indicating, as it does, a failure of coherence between the layers of deposit, may probably be taken as a proof that these layers were originally laid down at intervals of sufficient duration to admit of a considerable amount of consolidation of one layer before the deposition of the next. It is quite possible that in many, if not in most cases, these intervals were of longer duration than those required for the successive deposit of the laminae. In estimating therefore the length of time represented by say one foot of such finely laminated rock, we might reasonably regard the actual time occupied in deposition as only a small fraction of the whole interval.

The existence of laminae points to tranquil conditions

of slow intermittent deposit. The sediment has been borne at intervals and fallen over the same area of undisturbed water. Regularity of thickness and persistence of lithological character among the laminae may be taken to indicate periodic currents, of approximately equal force, from the same quarter. In some cases successive tides in a sheltered estuary may have been the agent of deposition. In others the sediment was doubtless brought by recurring river-floods. A great thickness of laminated rock, like the massive shales of Palaeozoic formations, points to a prolonged period of quiescence, and probably, in most cases, to slow, tranquil subsidence of the sea-floor. On the other hand, the alternation of thin bands of laminated rock with others coarser in texture and non-laminated suggests considerable oscillation of currents from different quarters bearing different qualities and amounts of sediment.

Strata or Beds are layers of rock varying from an inch or less up to many feet in thickness. A stratum may be made up of many laminae, if the nature of the sediment and mode of deposit have favored the production of this structure. This has very commonly been the case where the sediment has been exceedingly fine-grained. Where the materials are of coarser grain, the strata, as a rule, are not laminated, but form the thinnest parallel divisions of the mass of rock. Strata, like laminae, may either cohere firmly, or, as more usually happens, be separable with more or less ease from each other. In the former case we may suppose the upper to have followed the lower bed without the lapse of an interval long enough to allow of the consolidation of the latter. The common merging of a stratum into that which overlies it must no doubt be regarded as evidence of more or less gradual change in the conditions of deposit. Where the overlying bed shows no cohesion with that below it, the interval was probably of some duration. A stratum may be one of a series of similar beds in the same mass of rock. Thus a thick sandstone consists of many individual strata, varying it may be very considerably in their respective thicknesses. Or a stratum may be complete and distinct in itself, as where one of limestone or ironstone runs through the heart of a series of shales. As a general rule we may conclude that wherever among sedimentary accumulations stratification is exceedingly well-marked, the rocks were formed rather slowly, and that where it is weak or absent the conditions of deposit were more rapid, without the intervals and changes necessary for the production of the distinctly stratified structure.

Order of Superposition—the Foundation of Geological Chronology.—As sedimentary strata are laid down upon one another in a more or less nearly horizontal position, the underlying beds must be older than those which cover them. This simple and obvious truth is termed the law of superposition. It furnishes the means of determining the chronology of rocks, and though other methods of ascertaining this point are employed, they must all be based originally upon the observed order of superposition. The only case where the apparent superposition may be deceptive is where the strata have been inverted. In the Alps, for example the rocks composing huge mountain masses have been so completely overturned that the highest beds appear as if regularly covered by others which ought properly to underlie them. But these are exceptional occurrences, where the true order can usually be made out from other sources of evidence.

Alternations of Strata.—Though great variations occur in the nature of the strata composing a mass of sedimentary rocks, it may often be observed that certain repetitions occur. Sandstones, for example, are found to be interleaved with shale above, and then to pass

into shale; the latter may in turn become sandy at the top and be finally covered by sandstone, or may assume a calcareous character and pass up into limestone. Such alternations bring before us the conditions under which the sedimentation took place. A sandstone group indicates water of comparatively little depth, moved by changing currents, bringing the sand now from one side now from another. The passage of such a group into one of shale points to a diminution in the motion and transporting power of the water, perhaps to a sinking of the tract, whereby only fine mud was then intermittently brought into it. The advent of a limestone above the shale serves to show that the water cleared, owing to a deflexion of the sediment-carrying currents, or to continued and perhaps more rapid subsidence, and that *Foraminifera*, corals, crinoids, *Mollusca*, or other lime-secreting organisms, establish themselves upon the spot. Shale overlying the limestone would tell of fresh inroads of mud, which destroyed the animal life that had been flourishing on the bottom; while a return of sandstone beds would mark how, in the course of time, the original conditions of troubled currents and shifting sandbanks returned. Such alternating groups of sandy, calcareous, and argillaceous strata are well illustrated among the Jurassic formations of England.

Associations of Strata.—Certain kinds of strata very commonly occur together, because the conditions under which they were formed were apt to arise in succession. One of the most familiar examples is the association of coal and fire-clay. A seam of coal is almost invariably found to lie on a bed of fire-clay, or on some argillaceous stratum. The reason of this union becomes at once apparent when we learn that the fire-clay formed the soil on which the plants grew that went to form the coal. Where the clay was laid down under suitable circumstances vegetation sprang up upon it. Again, conglomerate and sandstone occur together rather than conglomerate and shale, because the agitation of the water which could form and deposit coarse detritus, like that composing conglomerate, was too great to admit of the accumulation of fine silt. For a similar reason we may look for shale or clay rather than sandstone as an accompaniment of limestone.

Relative Lapse of Time represented by Strata and by the Intervals between them.—Of the absolute length of time represented by any strata or groups of strata we can form no satisfactory estimates. Certain general conclusions may indeed be drawn, and comparisons may be made between different series of rocks. Sandstones full of false-bedding were probably accumulated more rapidly than finely-laminated shales or clays. It is not uncommon in certain Carboniferous formations to find huge coniferous trunks imbedded in an inclined position in sandstone. These trees seem to have been carried along and to have sunk, their heavier or root-end touching the bottom, and their upper end pointing upward in the direction of the current, exactly as in the case of the snags of the Mississippi. The continuous deposit of sand at last rose above the level of the trunks and buried them. It is clear then that the rate of deposit must have been sufficiently rapid to have allowed a mass of twenty or thirty feet of sand to accumulate before the decay of the wood; though modern instances are known where, under certain circumstances, submerged trees may last for some centuries. Continuous layers of the same kind of deposit suggest a persistence of geological conditions; numerous alternations of different kinds of sedimentary matter point to vicissitudes or alternations of conditions. As a rule, we should infer that the time represented by a given thickness of similar strata was less than that shown by the same thickness

of dissimilar strata, because the changes needed to bring new varieties of sediment into the area of deposit would usually require the lapse of some time for their completion. But this conclusion might often be erroneous. It would be best supported when, from the very nature of the rocks, wide variations in the character of the water-bottom could be established. Thus a group of shales followed by a fossiliferous limestone would almost always mark the lapse of a much longer period than an equal depth of sandy strata. Limestones made up of organic remains which lived and died upon the spot, and whose remains are crowded together generation above generation, must have demanded many years for their formation.

It is by the remains of plants and animals imbedded among the stratified rocks that the most satisfactory subdivisions of the geological record can be made. A chronological succession of organic forms can be made out among the rocks of the earth's crust. A certain common facies or type of fossils is found to characterize particular groups of rock, and to hold true even though the lithological constitution of the strata should greatly vary. Moreover, though comparatively few species are universally diffused, they possess remarkable persistence over wide areas, and even when they are replaced by others, the same general facies of fossils remains. Hence the stratified formations of two countries geographically distant, and having little or no lithological resemblance to each other, may be compared and paralleled zone by zone, simply by means of their inclosed organic remains.

PALÆONTOLOGICAL GEOLOGY.

Palæontology is the science which treats of the structure, affinities, classification, and distribution in time of the forms of plant and animal life imbedded in the rocks of the earth's crust. In one sense it may be regarded as a branch of zoölogy and of botany, its claim in this view to rank as a separate science resting almost solely on the fact that of the forms with which it deals but a small proportion belongs to the living world. In another aspect it may be looked upon as a branch of geology, seeing that its assistance is absolutely indispensable in many of the most familiar and fundamental problems of the latter science. It is under this last aspect that we have to regard it here. We shall consider merely those leading features of palæontological inquiry without some knowledge of which progress in modern geology would be impossible.

Fossils.—Palæontological geology, then, deals with the fossils or organic remains preserved in the rocks, and endeavors to gather from them information as to the history of the globe and its inhabitants. The term "fossil," meaning literally anything "dug up," was formerly applied indiscriminately to any mineral substance taken out of the earth's crust, whether organized or not. Ordinary minerals and rocks were thus included as fossils. For many years, however, the meaning of the word has been restricted, so as to include only the remains or traces of plants and animals preserved in any natural formation, whether hard rock or superficial deposit. The idea of antiquity or relative date is not necessarily involved in this conception of the term. Thus the bones of a sheep buried under gravel and silt by a modern flood, and the obscure crystalline traces of a coral in ancient masses of limestone, are equally fossils.

Nor has the term fossil any limitation as to organic grade. It includes not merely the remains of organisms, but also whatever was directly connected with or produced by these organisms. Thus the resin which was exuded from trees of long-perished forests is as much a

fossil as any portion of the stem, leaves, flowers, or fruit, and in some respects is even more valuable to the geologist than more determinable remains of its parent trees, because it has often preserved in admirable perfection the insects which flitted about in the woodlands. The burrows and trails of a worm preserved in sandstone and shale claim recognition as fossils, and indeed are commonly the only indications to be met with of the existence of annelid life among old geological formations. The droppings of fishes and reptiles, called coprolites, are excellent fossils, and tell their tale as to the presence of vertebrate life in ancient waters.

The term fossil, moreover, suffers no restriction as to the condition or state of preservation of any organism. In some rare instances the very flesh, skin, and hair of a mammal have been preserved for thousands of years, as in the case of the mammoths entombed within the frozen mud cliffs of Siberia.

Conditions for the Preservation of Organic Remains.

—At the outset the question naturally suggests itself how the remains of plants and animals come to have been preserved in rocks at all. If we observe what takes place at the present day, and argue that it may fairly be taken as an indication of what has been the ordinary condition of things in the geological past, we see that there must have been so many chances against the conservation of either animal or plant remains that their occurrence among stratified formations should be regarded as exceptional, and as the result of various fortunate accidents.

I. Consider, in the first place, what chances exist for the preservation of remains of the present fauna and flora of a country. The surface of the land may be densely clothed with forest, and abundantly peopled with animal life. But the trees die and molder into soil. The animals, too, disappear, generation after generation, and leave no perceptible traces of their existence. If we were not aware from authentic records that central and northern Europe was covered with vast forests at the beginning of our era, how could we know this fact? What has become of the herds of wild oxen, the bears, wolves, and other denizens of primeval Europe? How could we prove from the examination of the surface soil of any country that those creatures had once abounded there? We might search in vain for any such superficial traces, and would learn by so doing that the law of nature is everywhere "dust to dust."

The considerations for the preservation of any relics of the plant and animal life of a terrestrial surface must therefore be always exceptional. They are supplied only where the organic remains can be protected from the air and superficial decay. Hence they may be observed in

Lakes.—Over the floor of a lake deposits of silt, peat, marl, etc., are formed. Into these the stems, branches, leaves, flowers, fruits, or seeds of plants from the neighboring land may be carried, together with the bodies of land animals, insects and birds. An occasional storm may blow the lighter debris of the woodlands into the water. Such portions of the wreck as did not float, and were not washed ashore again, might sink to the bottom. Of these the larger part would in most cases probably rot away, so that, in the end, only a very small fraction of the whole vegetable matter cast over the lake by the wind would be covered up and preserved at the bottom. In like manner the animal remains swept by winds or by river floods into the lake would run so many risks of dissolution that only a proportion of them, and probably merely a small proportion, would be preserved. When we consider these chances against the conservation of the vegetable and animal life of the land, we must admit that, at the best,

lake-bottoms can contain but a meager and imperfect representation of the abundant life of the adjacent hills and plains.

But lakes have a distinct flora and fauna of their own. Their aquatic plants may be entombed in the gathering deposits of the bottom. Their mollusks, of characteristic types, sometimes form, by the accumulation of their remains, sheets of soft calcareous marl, in which many of the undecayed shells are preserved. Their fishes, likewise distinctly lacustrine, no doubt must often be entombed in the silt or marl.

Peat-mosses.—Wild animals venturing on the more treacherous watery parts of a peat-bog are sometimes engulfed or "laired." The antiseptic qualities of the peat preserve such remains from decay. Hence from European peat-mosses numerous remains of deer and oxen have been exhumed. Evidently the larger beasts of the forest ought chiefly to be looked for in these localities.

Caverns.—These are eminently adapted for the preservation of the higher forms of terrestrial life. Most of our knowledge of the prehistoric mammalian fauna of Europe is derived from what has been disinterred from *bone-caves*. As these recesses lie for the most part in limestone or in calcareous rock, their floors are commonly coated with stalagmite from the drip of the roof; and as this deposit is of great closeness and durability it has effectually preserved whatever it has covered or enveloped. The caves have in many instances served predatory beasts, like the hyæna, cave-lion, and cave-bear, as dens in which they slept, and into which some of them dragged their prey. In other cases they have been merely holes into which different animals crawled to die, or into which they fell or were swept by inundations. Under whatever circumstances the animals left their remains in these subterranean retreats, the result has been that the bones have been covered up and preserved. Still, we must admit that after all but a mere fraction even of the mammals of the time would enter the caves, and therefore that the evidence of the cavern-deposits, profoundly interesting and valuable as it is, presents us with merely a glimpse of one aspect of the life of the land.

In the next place, if we turn to the sea, we find certainly many more favorable conditions for the preservation of organic forms, but also many circumstances which operate against it. While the level of the land remains stationary, there can be but little effective entombment of marine organisms in littoral deposits; for only a limited accumulation of sediment will be formed until subsidence of the sea-floor takes place. In the trifling beds of sand or gravel thrown up on a stationary shore, only the harder and more durable forms of life, such as gasteropods and lamellibranchs, which can withstand the tritulating effects of the beach waves, are likely to remain uneffaced.

Below tide-marks, along the margin of the land where sediment is gradually deposited, the conditions are favorable for the preservation of marine organisms. Sheets of sand and mud are there laid down. In those sediments the harder parts of many forms of life may be entombed and protected from decay. But only a small portion of the total marine fauna may be expected to occur in such deposits. At the best, merely littoral and shallow-water forms will occur, and even under the most favorable conditions they will represent but a fraction of the whole assemblage of life in these juxta-terrestrial parts of the ocean. As we recede from the land the rate of deposition of sediment on the sea-floor must become feebler, until in the remote central abysses it reaches a hardly appreciable minimum. Except, therefore, where organic deposits, such as ooze, are

forming in these more pelagic regions, the conditions must be on the whole unfavorable for the preservation of any adequate representation of the deep-sea fauna. Hard, enduring objects, such as teeth and bones, may slowly accumulate and be protected by a coating of peroxide of manganese, or of some of the silicates above referred to as now forming here and there over the deep sea bottom. But such a deposit, if raised into land, would supply but a meager picture of the life of the sea.

We must conclude therefore that of the whole sea-floor the area best adapted for preserving a varied suite of marine organic exuvie is that belt which, running along the margin of the land, is ever receiving fresh layers of sediment transported by rivers and currents from the adjacent shores. The most favorable conditions for the accumulation of a thick mass of marine fossiliferous strata will arise when the area of deposit is undergoing a gradual subsidence. If the rate of depression and that of deposit were equal, or nearly so, the movement might proceed for a vast period without producing any great apparent change in marine geography, and even without seriously affecting the distribution of life over the sea-floor within the area of subsidence. Hundreds or thousands of feet of sedimentary strata might in this way be heaped up round the continents, containing a fragmentary series of organic remains belonging to those forms of shallow-water life which had hard parts capable of preservation.

There can be little doubt that such has in fact been the history of the main mass of stratified formations in the earth's crust. These piles of marine strata have unquestionably been laid down in comparatively shallow water within the area of deposit of terrestrial sediment. Their great depth seems only explicable by prolonged and repeated movements of subsidence, interrupted, however, as we know, by other movements of a contrary kind. These geographical changes affected at once the deposition of inorganic materials and the succession of organic forms. One series of strata is sometimes abruptly succeeded by another of a very different character, and we generally find a corresponding contrast between their respective organic contents.

Relative Value of Organic Remains as Fossils.—As the conditions for the preservation of organic remains exist more favorably under the sea than on land, marine organisms must be far more abundantly conserved than those of the land. This is true to-day, and has been true in all past geological time. Hence for the purposes of the geologist the fossil remains of marine forms of life far surpass all others in value. Among them there will necessarily be a gradation of importance regulated chiefly by their relative abundance. Now, of all the marine tribes which live within the juxta-terrestrial belt of sedimentation, unquestionably the *Mollusca* stand in the place of preëminence as regards their aptitude for becoming fossils. In the first place they almost all possess a hard durable shell, capable of resisting considerable abrasion, and readily passing into a mineralized condition. In the next place they are extremely abundant both as to individuals and genera. They occur on the shore within tide mark, and range thence down into the abysses. Moreover, they appear to have possessed those qualifications from early geological times. In the marine *Mollusca*, therefore, we have a common ground of comparison between the stratified formations of different periods. They have been styled the alphabet of paleontological inquiry.

Looking at the organisms of the land, we perceive that, as a rule, the abundant terrestrial flora has a comparatively small chance of being well represented

in a fossil state, that indeed, as a rule, only that portion of it of which the leaves, twigs, flowers, and fruits are blown into lakes is likely to be partially preserved. Terrestrial plants, therefore, occur in comparative rarity among stratified rocks, and furnish in consequence only limited means of comparison between the formations of different ages and countries. Of land animals the vast majority perish and leave no permanent trace of their existence. Predatory and other forms whose remains may be looked for in caverns or peat-mosses, must occur more numerous in the fossil state than birds, and are correspondingly more valuable to the geologist for the comparison of different strata.

Relative Age of Fossils.—Although absolute dates cannot be fixed in geological chronology, it is not difficult to determine the relative age of different strata, and consequently of their inclosed organic remains. For this purpose the fundamental law is based on what is termed the "order of superposition." This law may be thus defined: in a series of stratified formations the older must underlie the younger. It is not needful that we should actually see the one lying below the other. If a continuous conformable succession of strata dips steadily in one direction we know that the beds at the one end must underlie those at the other, because we can trace the whole succession of beds between them. Rare instances occur where strata have been so folded by great terrestrial disturbance that the younger are made to underlie the older. But this inversion can usually be made quite clear from other evidence. The true order of superposition is decisive of the relative ages of stratified rocks.

Uses of Fossils in Geology.—There are two main purposes to which fossils may be put in geological research:—(1) to throw light upon former conditions of physical geography, such as the presence of land, rivers, lakes, and seas, in places where they do not now exist, changes of climate, and the former distribution of plants and animals; and (2) to furnish a guide in geological chronology whereby rocks may be classified according to relative date and the facts of geological history may be arranged and interpreted as a connected record of the earth's progress.

Subdivisions of the Geological Record by means of Fossils.—As fossil evidence furnishes a much more satisfactory and widely applicable means of subdividing the stratified rocks of the earth's crust than mere lithological characters, it is made the basis of the geological classification of these rocks. Thus we may find a particular stratum marked by the occurrence in it of various fossils, one or more of which may be distinctive, either from occurring in no other bed above and below, or from special abundance in that stratum. These species might therefore be used as a guide to the occurrence of the bed in question, which might be called by the name of the most abundant species. In this way a geological horizon or zone would be marked off, and geologists would thereafter recognize its exact position in the series of formations. But before such a generalization can be safely made, we must be sure that the species in question really never does appear on any other platform. This evidently demands wide experience over an extended field of observation. The assertion that a particular species occurs only on one horizon manifestly rests on negative evidence as much as on positive. The paleontologist who makes it cannot mean more than that he knows the fossil to lie on that horizon, and that, so far as his own experience and that of others goes, it has never been met with anywhere else. But a single example of the occurrence of the fossil on a different zone would greatly damage the value of his generalization, and a few such cases would demolish it altogether. Hence all such

statements ought at first to be made tentatively. To establish a geological horizon on limited fossil evidence, and then to assume the identity of all strata containing the same fossils, is to reason in a circle and to introduce utter confusion into our interpretation of the geological record. The first and fundamental point is to determine accurately the order of superposition of the strata. Until this is done detailed palæontological classification may prove to be worthless. But when once the succession of the rocks has been fixed palæontological evidence may become paramount.

STRATIGRAPHICAL GEOLOGY.

This branch of the science arranges the rocks of the earth's crust in the order of their appearance, and interprets the sequence of events of which they form the records. Its province is to cull from all the other departments of geology the facts which may be needed to show what has been the progress of our planet, and of each continent and country, from the earliest times of which the rocks have preserved any memorial. Thus from mineralogy and petrography it obtains information regarding the origin and subsequent mutations of minerals and rocks. From dynamical geology it learns by what agencies the materials of the earth's crust have been formed, altered, broken, upheaved, and melted. From structural geology it understands how these materials were put together so as to build up the complicated crust of the earth. From palæontological geology it receives in well-determined fossil remains a clue by which to discriminate the different stratified formations, and to trace the grand onward march of organized existence upon this planet. Stratigraphical geology thus gathers up the sum of all that is made known by the other departments of the science, and makes it subservient to the interpretation of the geological history of the earth.

The leading principles of stratigraphy may be summed up as follows:

1. In every stratigraphical research the fundamental requisite is to establish the order of superposition of the strata. Until this is accomplished it is impossible to arrange the dates and make out the sequence of geological history.
2. The stratified portion of the earth's crust, or geological record, as it has been termed, may be subdivided into natural groups or formations of strata, each marked throughout by some common genera or species, or by a general resemblance in the type or character of its organic remains.
3. Many living species of plants and animals can be traced downward through the more recent geological formations; but they grow fewer in number as they are followed into more ancient deposits. With their disappearance we encounter other species and genera which are no longer living. These in turn may be traced backward into earlier formations, till they too cease, and their places are taken by yet older forms. It is thus shown that the stratified rocks contain the records of a gradual progression of organic forms. A species which has once died out does not seem ever to have reappeared. But as has been already pointed out in reference to Barrande's doctrine of colonies, a species may within a limited area appear in a formation older than that of which it is characteristic, having temporarily migrated into the district from some neighboring region where it had already established itself.
4. When the order of succession of organic remains among the stratified rocks has been determined, they become an invaluable guide in the investigation of the relative age of rocks and the structure of the land. Each zone and formation, being characterized by its own species or genera, may be recognized by their means,

and the true succession of strata may thus be confidently established even in a country which has been shattered by dislocation, or where the rocks have been folded and inverted.

5. The relative chronological value of the divisions of the geological record is not to be measured by mere depth of strata. While it may be reasonably assumed that a great thickness of stratified rock must mark the passage of a long period of time, it cannot safely be affirmed that a much less thickness elsewhere represents a correspondingly diminished period. This may sometimes be made evident by an unconformability between two sets of rocks, as has already been explained. The total depth of both groups together may be, say 1,000 feet. Elsewhere we may find a single unbroken formation reaching a depth of 10,000 feet; but it would be utterly erroneous to conclude that the latter represents ten times the length of time shown by the two former. So far from this being the case, it might not be difficult to show that the minor thickness of rock really denoted by far the longer geological interval. If, for instance, it could be proved that the upper part of both the sections lay on one and the same geological platform, but that the lower unconformable series in the one locality belonged to a far lower and older system of rocks than the base of the thick conformable series in the other, then it would be clear that the gap marked by the unconformability really indicated a longer period than the massive succession of deposits.

6. Fossil evidence furnishes the chief means of comparing the relative value of formations and groups of rock. A break in the succession of organic remains marks an interval of time often unrepresented by strata at the place where the break is found. The relative importance of these breaks, and therefore, probably, the comparative intervals of time which they mark, may be estimated by the difference of the facies of the fossils on each side. If, for example, in one case we find every species to be dissimilar above and below a certain horizon, while in another locality only half of the species on each side are peculiar, we naturally infer, if the total number of species seems large enough to warrant the inference, that the interval marked by the former break was very much longer than that marked by the second. But we may go further and compare by means of fossil evidence the relation between breaks in the succession of organic remains and the depth of strata between them.

Three formations of fossiliferous strata, A, C and H, may occur conformably above each other. By a comparison of the fossil contents of all parts of A, it may be ascertained that, while some species are peculiar to its lower, others to its higher portions, yet the majority extend throughout the formation. If now it is found that of the total number of species in the upper portion of A only one-third passes up into C, it may be inferred with some probability that the time represented by the break between A and C was really longer than that required for the accumulation of the whole of the formation A. It might even be possible to discover elsewhere a thick intermediate formation B filling up the gap between A and C. In like manner were it to be discovered that, while the whole of the formation C is characterized by a common suite of fossils, not one of the species and only one half of the genera pass up into H, the inference could hardly be resisted that the gap between the two formations marks the passage of a far longer interval than was needed for the deposition of the whole of C. And thus we reach the remarkable conclusion that thick though the stratified formations of a country may be, in some cases they may not represent so long a total

period of time as do the gaps in their succession—in other words, that non-deposition was more frequent and prolonged than deposition, or that the intervals of time which have been recorded by strata have not been so long as those which have not been so recorded.

In all speculations of this nature, however, it is necessary to reason from as wide a basis of observation as possible, seeing that so much of the evidence is negative. Especially needful is it to bear in mind that the cessation of one or more species at a certain line among the rocks of a particular district may mean nothing more than that, owing to some change in the conditions of life or of deposition, these species were compelled to migrate or became locally extinct at the time marked by that line. They may have continued to flourish abundantly in neighboring districts for a long period afterward. Many examples of this obvious truth might be cited. Thus in a great succession of mingled marine, brackish-water, and terrestrial strata, like that of the Carboniferous Limestone series of Scotland, corals, crinoids, and brachiopods abound in the limestones and accompanying shales, but disappear as the sandstones, ironstones, clays, coals, and bituminous shales supervene. An observer meeting for the first time with an instance of the disappearance, and remembering what he had read about "breaks in succession," might be tempted to speculate about the extinction of these organisms, and their replacement by other and later forms of life, such as the ferns, lycopods, ganoid fishes, and other fossils so abundant in the overlying strata. But further research would show him that high above the plant-bearing sandstones and coals other limestones and shales might be observed, once more charged with the same marine fossils as before, and still farther overlying groups of sandstones, coals, and carbonaceous beds followed by yet higher marine limestones. He would thus learn that the same organisms, after being locally exterminated, returned again and again to the same area. After such a lesson he would probably pause before too confidently asserting that the highest bed in which we can detect certain fossils marked really their final appearance in the history of life. A break in the succession may thus be extremely local, one set of organisms having been driven to a different part of the same region; while another set occupied their place until the first was enabled to return.

7. The geological record is at the best but an imperfect chronicle of the geological history of the earth. It abounds in gaps, some of which have been caused by the destruction of strata owing to metamorphism, denudation, or otherwise, some by original non-deposition, as above explained. Nevertheless from this record alone can the progress of the earth be traced. It contains the registers of the births and deaths of tribes of plants and animals which have from time to time lived on the earth. But a small proportion of the total number of species which have appeared in past time have been thus chronicled, yet, by collecting the broken fragments of the record, an outline, at least, of the history of life upon the earth can be deciphered.

The geological record is classified into five main divisions: (1) the Archaean, Azoic (lifeless), or Eozoic (dawn of life) Periods; (2) the Primary or Palaeozoic (ancient life) Periods; (3) the Secondary or Mesozoic (middle life) Periods; (4) the Tertiary or Cainozoic (recent life); and (5) the Quaternary or Post-Tertiary Periods. These divisions are further ranged into systems, each system into formations, each formation into groups, and each group or series into single zones or horizons. The subjoined generalized table exhibits the order in which the chief subdivisions appear:

Order of Succession of the Stratified Formation of the Earth's Crust.

	BRITAIN.	CONTINENTAL EUROPE.	NORTH AMERICA.
Post-Tertiary or Quaternary.	Recent—Alluvium, peat, etc. Pleistocene— <i>Cave deposits, Glacial drift.</i>	Alluvium. Diluvium.	Recent or Terrace. Champlain. Glacial.
Tertiary or Cainozoic.	Pliocene — <i>Crag deposits of Norfolk and Suffolk.</i> Miocene— <i>Lignite of Bovey Tracey, Mull, etc.</i> Eocene — <i>Tertiarries of Hampshire Basin and Isle of Wight.</i>	Pliocene — <i>Tegel, Dinotherium-Sand.</i> Miocene— <i>Leitha-kalk, Upper Molasse.</i> Oligocene— <i>Lower Molasse, Gres de Fontainebleau, etc.</i> Eocene — <i>Nammulde-limestone, Flysch.</i>	Sumter. Yorktown. Alabama. Lignitic.
Secondary or Mesozoic.	Cretaceous. { Upper. Lower. Jurassic. { Oolitic. { Upper. Lower. Lias-sic. { Lower. Triassic. { Upper. Lower.	Senonian — <i>Craie blanche et tuffeau, Upper Quadersandstein.</i> Turonian — <i>Planerkalk.</i> Cenomanian — <i>Gres vert.</i> Gault. Necomian. Upper or White Jura (Malm). Middle or Brown Jura (Dogger). Lower or Black Jura (Lias). Rhatic beds, Keuper. Muschelkalk. Bunter.	Fox-Hills group. Pierre group. Niobrara group. Benton gr'p. Dakota gr'p. Jurassic rocks appear to be but poorly developed in N. America. Triassic
Primary or Palaeozoic.	Permian. Carboniferous. { Coal-measures. Millstone Grit. Carboniferous Limestone. Devonian and Old Red Sandstone. Silurian. Cambrian.	Dyas or { <i>Zechstein, Rothliegendes.</i> Permian. Terrain houiller, Steinkohlen. Flotzleer Sandstein. Calcaire Carbonifere, Kohlenkalk, Kulm. Devonian. Silurian (Transition or Grauwacke system). Primordial Silurian, older grauwacke and slate. Primitive schists.	Permian. Carboniferous. Sub-Carboniferous. Devonian. Silurian. Primordial Silurian and Cambrian. Huronian.
Archaean or Azoic (Eozoic).	Fundamental gneiss.	Ur-gneiss.	Laurentian.

The nomenclature adopted for the subdivisions of the geological record bears witness to the rapid growth of geology. It is a patch-work in which no system nor language has been adhered to, but where the influences by which the progress of the science has been molded may be distinctly traced. Some of the earliest names are lithological, and remind us of the fact that mineralogy and petrography preceded geology in the order of birth—Chalk, Oolite, Greensand, Millstone Grit. Others are topographical, and often recall the labors of the early geologists of England—London Clay, Oxford Clay, Purbeck, Portland, Kimeridge beds. Others are taken from local English provincial names, and remind us of the debt we owe to William Smith, by whom so many of them were first used—Lias, Gault, Crag, Cornbrash. Others of later date recognize an order of superposition as already established among formations—Old Red Sandstone, New Red Sandstone. By common consent it is admitted that names taken from the region where a formation or group of rocks is typically developed are best adapted for general use. Cambrian, Silurian, Devonian, Permian, Jurassic, are of this class, and have been adopted all over the globe.

But whatever be the name chosen to designate a particular group of strata, it soon comes to be used as a chronological or homotaxial term, apart altogether from the stratigraphical character of the strata to which it is applied. Thus we speak of the Chalk or Cretaceous system, and embrace under that term formations which may contain no chalk; and we may describe as Silurian a series of strata utterly unlike in lithological characters to the formations in the typical Silurian country. In using these terms we unconsciously allow the idea of relative date to arise prominently before us. Hence such a word as chalk or cretaceous does not suggest so much to us the group of strata so called, as the interval of geological history which these strata represent. We speak of the Cretaceous, Jurassic and Cambrian periods, and of the Cretaceous fauna, the Jurassic flora, the Cambrian trilobites, as if these adjectives denoted simply epochs of geological time.

PHYSIOGRAPHICAL GEOLOGY.

In the investigation of the geological history of any country, two questions present themselves. We have first to consider the nature and arrangement of the rocks which underlie the surface, and to ascertain from them what has been the march of events, what changes in geography have successively taken place, and what races of plants and animals have come and gone. The gradual geological evolution of the earth has been sketched in the foregoing part of this article. But besides the history of the solid rocks beneath the surface of the land, there is that of the surface itself. Mountains and plains, valleys and ravines, cliffs, peaks, passes, lakes, and the many other features of a country demand attention. By what processes have these varied outlines been impressed upon the surface of the globe? Are they of different ages, and if so, how can their history be ascertained?

The branch of geological inquiry which endeavors to answer these questions has been termed Physiography or Physiographical Geology. Its investigations evidently demand an acquaintance with Stratigraphical Geology. We must be able to trace out the former geographical conditions of the globe before we can adequately reason on the origin of those now existing. Hence the consideration of this branch of the subject has necessarily been reserved for this concluding section.

The stratified formations, of which the succession and history have been traced in the previous pages.

were chiefly laid down on the sea-floor in wide horizontal or gently inclined sheets. They have since been upraised into land; their horizontality has been in great part destroyed; and they have been enormously wasted by denuding agents. In considering, therefore, how they have acquired their present external forms, we have to deal with the effects of two kinds of forces, one acting from below, the other on the surface.

These stratified rocks were, on the whole, deposited in shallow water, and have been repeatedly upraised and denuded, so that the younger have been formed out of the waste of the older. They have their modern counterparts, not in the deposits of the great ocean-basins, but in those of comparatively shallow seas. The inference to be drawn from these facts is that the present continental regions, through many local oscillations, have existed as terrestrial ridges from a remote geological antiquity, and that the ocean basins in like manner have, on the whole, retained their identity. When the geologist asks himself how the present distribution of sea and land is to be accounted for, he finds that the answer to the question goes back to early Palæozoic times, whence he can in some cases trace the gradual growth of a continent downward through the long cycles of geological time. But there still remains the problem to account for the original wrinkling of the surface of the globe, whereby the present great ridges and hollows were produced.

It is now generally agreed that these inequalities have been produced by unequal contraction of the earth's mass, the interior contracting more than the outer crust, which must therefore have accommodated itself to this diminution of diameter by undergoing corrugation. But there seems to have been some original distribution of materials in the globe that initiated the depressions on the areas which they have retained.

The geological phenomena long ago led to a belief in the liquidity of the earth's interior. Since this belief has been so weightily opposed by the physical arguments already adduced, geologists have endeavored to modify it in such a way as, if possible, to satisfy the requirements of physics, while at the same time providing an adequate explanation of the corrugation of the earth's crust. Mr. Hopkins, Professor Dana, Professor Shaler, and Mr. Fisher have, on different grounds, advocated the existence of a fluid or viscous substratum beneath the crust, the contraction and consolidation of which produce the corrugations of the rocks and of the surface. "The increase of temperature," says Mr. Fisher, "though rapid near the surface, becomes less and less as we descend, so that, if the earth were once wholly melted, the temperature near the center is not very greatly above what it is at a depth which, compared to the earth's radius, is small. Consequently, if it requires great pressure to solidify the materials at such a temperature, it is probable that the melting temperature may be reached before the pressure is sufficient to solidify." The crust, of course, must be able to sustain itself on the corrugated surface of the supposed viscous layer without breaking up and sinking. The same writer has even suggested that the observed amount of corrugation is more than can be accounted for even on this hypothesis, and that the shrinkage may have been due not merely to cooling, but to the escape of water from the interior in the form of the superheated steam of volcanic vents.

Leaving the vexed question of the condition of the earth's interior, the hypothesis of secular cooling and contraction furnishes a natural explanation of the origin of the dominant elevations and depressions of the surface, and of the intense crumpling which the rocks in many regions have undergone. Taking 0.09 as the

coefficient of contraction for a supposed stratum five hundred miles thick, lying beneath twenty-five miles of crust, and passing from a fused into a solid state, Mr. Fisher found that every one hundred miles measured along a great circle on the surface would have been one mile larger before the contraction, and that this might produce a triangular elevation of "twenty-five square miles on a base of one hundred miles, which would give a range of mountains half a mile high. If only fifty miles out of the hundred were disturbed, the range would be a mile high, and so on."

The effects of this lateral pressure may show themselves either in broad dome-like elevations, or in narrower and loftier ridges of mountain. The structure of the crust is so complex, and the resistance offered by it to the pressure is consequently so varied, that abundant cause is furnished for almost any diversity in the forms and distribution of the wrinkles into which it is thrown. It is evident, however, that the folds have tended to follow a linear direction. In North America, from early geological times, they have kept on the whole on the lines of meridians. In the Old World, on the contrary, they have chosen diverse trends, but the last great crummings—those of the Alps, Caucasus, and the great mountain ranges of central Asia—have risen along parallels of latitude.

Mountain chains must therefore be regarded as evidence of the shrinkage of the earth's mass. They may be the result of one movement, or of a long succession of such movements. Formed on lines of weakness in the crust, they have frequently given relief from the strain of compression by undergoing fresh crumpling and upheaval. The successive stages of uplift are usually not difficult to trace.

In the physiography of any region, the mountains are the dominant features. A true mountain chain consists of rocks which have been crumpled and pushed up in the manner already described. But ranges of hills almost mountainous in their bulk may be formed by the gradual erosion of valleys out of a mass of original high ground. In this way some ancient tablelands, those of Norway and of the Highlands of Scotland, for example, have been so channelled by deep fjords and glens that they now consist of massive rugged hills, either isolated or connected along the flanks. The forms of the valleys thus eroded have been governed partly by the structure and composition of the rocks, and partly by the relative potency of the different denuding agents. Where the influence of rain and frost has been slight, and the streams, supplied from distant sources, have had sufficient declivity, deep, narrow, precipitous ravines or gorges have been excavated. The cañons of the Colorado are a magnificent example of this result. Where, on the other hand, ordinary atmospheric action has been more rapid, the sides of the river channels have been attacked, and open sloping glens and valleys have been hollowed out. A gorge or defile is usually due to the action of a waterfall, which, beginning with some abrupt declivity or precipice in the course of the river when it first commenced to flow, or caused by some hard rock crossing the channel, has eaten its way backward.

Lakes may have been formed in several ways. 1. By subterranean movements as, for example, during those which gave rise to mountain chains. But these hollows, unless continually deepened by subsequent movements of a similar nature, would be filled up by the sediment continually washed into them from the adjoining slopes. The numerous lakes in such a mountain system as the Alps cannot be due merely to this cause, unless we suppose the upheaval of the mountains to have been geologically quite recent, or that subsidence must take place continuously or periodically below each

independent basin. But there is evidence that the upheaval of the lakes is not of recent date, while the idea of perpetuating lakes by continual subsidence would demand, not in the Alps merely, but all over the northern hemisphere where lakes are so abundant, an amount of subterranean movement of which, if it really existed, there would assuredly be plenty of other evidence. 2. By irregularities in the deposition of superficial accumulations prior to the elevation of the land or during the disappearance of the ice-sheet. The numerous tarns and lakes inclosed within mounds and ridges of drift-clay and gravel are examples. 3. By the accumulation of a barrier across the channel of a stream and the consequent ponding back of the water. This may be done, for instance, by a landslip, by the advance of a glacier across a valley, or by the throwing up of a bank by the sea across the mouth of a river. 4. By erosion. The only agent capable of excavating hollows out of the solid rock such as might form lake-basins is glacier-ice. It is a remarkable fact, of which the significance may now be seen, that the innumerable lake-basins of the northern hemisphere lie on surfaces of intensely ice-worn rock. The striæ can be seen on the smoother rock-surfaces slipping into the water on all sides. These striæ were produced by ice moving over the rock. If the ice could, as the striæ prove, descend into the rock-basins and mount up the farther side, smoothing and striating the rock as it went, it could erode the basins. It is hardly possible to convey in words an adequate conception of the enormous extent to which the north of Europe and North America has had its surface ground down by ice. The ordinary rough surfaces produced by atmospheric disintegration have been replaced by a peculiar flowing contour which is traceable even to below the sea-level.

Tablelands may sometimes arise from the abrasion of hard rocks and the production of a level plain by the action of the sea, or rather of that action combined with the previous degradation of the land by subaërial waste. But most of the great tablelands of the globe seem to be platforms of little-disturbed strata which have been upraised bodily to a considerable elevation.

GEOMETRICAL MEAN of two numbers is that number the square of which is equal to the product of the two numbers; thus, the geometrical mean of 9 and 16 is 12, for $9 \times 16 = 144 = 12^2$; hence the geometrical mean of two numbers is found by multiplying the two numbers together, and extracting the square root of the product.

GEOMETRICAL PROGRESSION. A series of quantities are said to be in geometrical progression when each term of the series is equal to that which precedes it multiplied by some constant factor—i. e., some factor which is the same for all the terms; or, in other words, when the ratio of any two successive terms is the same.

GEOMETRY [from *γη* (gê), the earth, and *μετρον* (metron), measure] has been divided since the time of Euclid into an "elementary" and a "higher" part. The contents and limits of the former have been fixed by Euclid's *Elements*. The latter included at the time of the Greek mathematicians principally the properties of the conic sections and of a few other curves. The methods used in both were essentially the same. These began to be replaced during the seventeenth century by more powerful methods, invented by Roberval, Pascal, Desargues, and others. But the impetus which higher geometry received in their works was soon arrested, in consequence of the discoveries of Descartes—the new calculus to which these gave rise absorbing the attention of mathematicians almost exclusively, until Monge, at the end of the eighteenth century, reestablished

"pure" as distinguished from Descartes' "coördinate" (or analytical) geometry. Since then the purely geometrical methods have been continuously extended, especially by Poncelet, Steiner, Von Staudt, and Cremona, and in England by Hirst and Henry Smith, to mention only a few of the leading names.

While higher geometry thus made most rapid progress, the elementary part remained almost unaltered. It has been taught up to the present day on the basis of Euclid's *Elements*, the latter being either used directly as a text-book (in England), or being replaced (in most parts of the continent) by text-books which are essentially Euclid's *Elements* rewritten, with a few additions about the mensuration of the circle, cone, cylinder, and sphere. Only within a very recent period have attempts been made to change the character of the elementary part by introducing some of the modern methods.

The object of geometry is to investigate the properties of space. The first step must consist in establishing those fundamental properties from which all others follow by processes of deductive reasoning. They are laid down in the Axioms, and these ought to form such a system that nothing need be added to them in order fully to characterize space, and that nothing may be left out without making the system incomplete. They must, in fact, completely "define" space. Several such systems are conceivable. Euclid has given one, others have been put forward in recent times by Riemann, by Helmholtz and by Grassmann. How many axioms the system ought to contain, and which system is the simplest, may be said to be still an open question. We shall consider only Euclid's system.

The axioms are obtained from inspection of space and of solids in space—hence from experience. The same source gives us the notions of the geometrical entities to which the axioms relate, viz., solids, surfaces, lines or curves, and points. A solid is directly given by experience; we have only to abstract all material from it in order to gain the notion of a geometrical solid. This has shape, size, position, and may be moved. Its boundary or boundaries are called surfaces. They separate one part of space from another, and are said to have no thickness. Their boundaries are curves or lines, and these have length only. Their boundaries, again, are points, which have no magnitude, but only position. We thus come in three steps from solids to points which have no magnitude; in each step we lose one extension. Hence we say a solid has three dimensions, a surface two, a line one, and a point none. Space itself, of which a solid forms only a part, is also said to be of three dimensions. The same thing is intended to be expressed by saying that a solid has length, breadth and thickness, a surface length and breadth, a line length only, and a point no extension whatsoever. Euclid gives the essence of these statements as definitions:

Def. 1, I. *A point is that which has no parts, or which has no magnitude.*

Def. 2, I. *A line is length without breadth.*

Def. 5, I. *A superficies is that which has only length and breadth.*

Def. 1, XI. *A solid is that which has length, breadth and thickness.*

If we allow motion in geometry, and it seems impossible to avoid it, we may generate these entities by moving a point, a line, or a surface, thus:

The path of a moving point is a line.

The path of a moving line is, in general, a surface.

The path of a moving surface is, in general, a solid.

And we may then assume that the lines, surfaces, and solids, as defined before, can all be generated in this manner. From this generation of the entities it follows

again that the boundaries—the first and last position of the moving element—of a line are points, and so on; and thus we come back to the considerations with which we started.

Euclid's definitions mentioned above are attempts to describe, in a few words, notions which we have obtained by inspection of and abstraction from solids. A few more notions have to be added to these, principally those of the simplest line—the straight line, and of the simplest surface—the flat surface or plane. These notions we possess, but to define them accurately is difficult. Euclid's Definition, "A straight line is that which lies evenly between its extreme points," must be meaningless to any one who has not the notion of straightness in his mind. Neither does it state a property of the straight line which can be used in any further investigation. Such a property is given in Axiom 10, I. It is really this axiom, together with Postulates 2 and 3, which characterizes the straight line.

While for the straight line the verbal definition and axiom are kept apart, Euclid mixes them up in the case of the plane. Here the Definition 7, I., includes an axiom. It defines a plane as a surface which has the property that every straight line which joins any two points in it lies altogether in the surface. But if we take a straight line and a point in such a surface, and draw all straight lines which join the latter to all points in the first line, the surface will be fully determined. This construction is therefore sufficient as a definition. That every other straight line which joins any two points in this surface lies altogether in it is a further property, and to assume it gives another axiom.

Thus a number of Euclid's axioms are hidden among his first definitions. A still greater confusion exists in the present editions of Euclid between the postulates and axioms so-called, but this is due to later editors and not to Euclid himself. The latter had the last three axioms put together with the postulates, so that these were meant to include all assumptions relating to space. The remaining assumptions which relate to magnitudes in general, viz., the first eight "axioms" in modern editions, were called "common notions." Of the latter a few may be said to be definitions. Thus the eighth might be taken as a definition of "equal," and the seventh of halves. If we wish to collect the axioms used in Euclid's *Elements*, we have therefore to take the three postulates, the last three axioms as generally given, a few axioms hidden in the definitions, and an axiom used by Euclid in the proof of Prop. 4 and on a few other occasions, viz., that figures may be moved in space without change of shape or size.

We shall not enter into the investigation how far the assumptions which would be included in such a list are sufficient, and how far they are necessary. It may be sufficient here to state that from the beginning of a geometrical science to the present century attempts without end have been made to prove the last of Euclid's axioms, that only at the beginning of the present century the futility of this attempt was shown, and that only within the last twenty years the true nature of the connection between the axioms has become known through the researches of Riemann and Helmholtz, although Grassmann had published already, in 1844, his classical but long-neglected *Ausdehnungslehre*.

The assumptions actually made by Euclid may be stated as follows:—

1. Straight lines exist which have the property that any one of them may be produced both ways without limit, that through any two points in space such a line can be drawn, and that any two of them coincide throughout their indefinite extensions as soon as two points in the one coincide with two points in the other.

2. Plane surfaces or planes exist having the property laid down in Def. 7, that every straight line joining any two points in such a surface lies altogether in it.

3. Right angles, as defined in Def. 10, are possible, and all right angles are equal; that is to say, wherever in space we take a plane, and wherever in that plane we construct a right angle, all angles thus constructed will be equal, so that any one of them may be made to coincide with any other.

4. Figures may be freely moved in space without change of shape or size. This is assumed by Euclid, but not stated as an axiom.

5. In any plane a circle may be described, having any point in that plane as center, and its distance from any other point in that plane as radius.

The definitions which have not been mentioned are all "nominal definitions," that is to say, they fix a name for a thing described. Many of them overdetermine a figure.

Euclid's *Elements* are contained in thirteen books. Of these the first four and the sixth are devoted to "plane geometry," as the investigation of figures in a plane is generally called. The fifth book contains the theory of proportion which is used in Book VI. The seventh, eighth, and ninth books are purely arithmetical, while the tenth contains a most ingenious treatment of geometrical irrational quantities. The remaining three books relate to figures in space, or, as it is generally called, to "solid geometry." The seventh, eighth, ninth, tenth, thirteenth, and part of the eleventh and twelfth books are now generally omitted from the school editions of the *Elements*. In the first four and in the sixth book it is to be understood that all figures are drawn in a plane.

GEORGE I., king of Great Britain and Ireland, born in 1660, was heir through his father Ernest Augustus to the hereditary lay bishopric of Osnabrück, and to the duchy of Calenberg, which formed one portion of the Hanoverian possessions of the house of Brunswick, while he secured the reversion of the other portion, the duchy of Celle or Zell, by his marriage (1682) with the heiress, his cousin Sophia Dorothea. The marriage was not a happy one. The morals of German courts in the end of the seventeenth century took their tone from the splendid profusion of Versailles. It became the fashion for a prince to amuse himself with a mistress or more frequently with many mistresses simultaneously, and he was often content that the mistresses whom he favored should be neither beautiful nor witty. George Louis followed the usual course. Count Königsmark—a handsome adventurer—seized the opportunity of paying court to the deserted wife. Conjugal infidelity was held at Hanover to be a privilege of the male sex. Count Königsmark was assassinated. Sophia Dorothea was divorced in 1694, and remained in seclusion till her death in 1726. When her descendant in the fourth generation attempted in England to call his wife to account for sins of which he was himself notoriously guilty, free-spoken public opinion reprobated the offense in no measured terms. In the Germany of the seventeenth century all free-spoken public opinion had been crushed out by the misery of the Thirty Years' War, and it was understood that princes were to arrange their domestic life according to their own pleasure.

The prince's father did much to raise the dignity of his family. By sending help to the emperor when he was struggling against the French and the Turks, he obtained the grant of a ninth electorate in 1692. His marriage with Sophia, the youngest daughter of Elizabeth the daughter of James I. of England, was not one which at first seemed likely to confer any prospect of advancement to his family. But though there were

many persons whose birth gave them better claims than she had to the English crown, she found herself, upon the death of the duke of Gloucester, the next Protestant heir after Anne. The Act of Settlement in 1701 secured the inheritance to herself and her descendants. Being old and unambitious she rather permitted herself to be burthened with the honor than thrust herself forward to meet it. Her son George took a deeper interest in the matter. In his youth he had fought with determined courage in the wars of William III. Succeeding to the electorate on his father's death in 1698, he had sent a welcome reinforcement of Hanoverians to fight under Marlborough at Blenheim. With prudent persistence he attached himself closely to the Whigs and to Marlborough, refusing Tory offers of an independent command, and receiving in return for his fidelity a guarantee by the Dutch of his succession to England in the Barrier treaty of 1709. In 1714 when Anne was growing old, and Bolingbroke and the more reckless Tories were coquetting with the son of James II., the Whigs invited George's eldest son, who was duke of Cambridge, to visit England in order to be on the spot in case of need. Neither the elector nor his mother approved of a step which was likely to alienate the queen, and which was specially distasteful to himself, as he was on very bad terms with his son. Yet they did not set themselves against the strong wish of the party to which they looked for support, and it is possible that troubles would have arisen from any attempt to carry out the plan, if the deaths, first of the electress (May 28) and then of the queen (August 1, 1714), had not laid open George's way to the succession without further effort of his own.

In some respects the position of the new king was not unlike that of William III. a quarter of a century before. Both sovereigns were foreigners, with little knowledge of English politics and little interest in English legislation. Both sovereigns arrived at a time when party spirit had been running high, and when the task before the ruler was to still the waves of contention. In spite of the difference between an intellectually great man and an intellectually small one, in spite too of the difference between the king who began by choosing his ministers from both parties, and the king who persisted in choosing his ministers from only one, the work of pacification was accomplished by George even more thoroughly than by William.

George I. was fortunate in arriving in England when a great military struggle had come to an end. He had therefore no reason to call upon the nation to make great sacrifices. All that he wanted was to secure for himself and his family a high position which he hardly knew how to occupy, to fill the pockets of his German attendants and his German mistresses, to get away as often as possible from the uncongenial islanders whose language he was unable to speak, and to use the strength of England to obtain petty advantages for his German principality. In order to do this he attached himself entirely to the Whig party, though he refused to place himself at the disposal of its leaders. He gave his confidence, not to Somers and Wharton and Marlborough, but to Stanhope and Townshend, the statesmen of the second rank. At first he seemed to be playing a dangerous game. The Tories, whom he rejected, were numerically superior to their adversaries, and were strong in the support of the country gentlemen and the country clergy. The strength of the Whigs lay in the towns and in the higher aristocracy. Below both parties lay the mass of the nation, which cared nothing for politics except in special seasons of excitement, and which asked only to be let alone. In 1715, a Jacobite insurrection in the north, supported by the appearance of the

Pretender, the son of James II., in Scotland, was suppressed, and its suppression not only gave to the government a character of stability, but displayed its adversaries in an unfavorable light as the disturbers of the peace.

A fortunate concurrence of circumstances enabled George's ministers, by an alliance with the regent of France, the duke of Orleans, to pursue at the same time the Whig policy of separating France from Spain and from the cause of the Pretender, and the Tory policy of the maintenance of a good understanding with their neighbor across the Channel. The same eclecticism was discernible in the proceedings of the home government. The Whigs were conciliated by the repeal of the Schism Act and the Occasional Conformity Act, while the Tories were conciliated by the maintenance of the Test Act in all its vigor. The satisfaction of the masses was increased by the general wellbeing of the nation.

Very little of all that was thus accomplished was directly owing to George I. The policy of the reign is the policy of his ministers. Stanhope and Townshend from 1714 to 1717 were mainly occupied with the defense of the Hanoverian settlement.

Nevertheless something of the honor due to Walpole must be reckoned to the king's credit. It is evident that at his accession his decisions were by no means unimportant. The royal authority was still able within certain limits to make its own terms. This support was so necessary to the Whigs that they made no resistance when he threw aside their leaders on his arrival in England. When by his personal intervention he dismissed Townshend and appointed Sunderland, he had no such social and parliamentary combination to fear as that which almost mastered his great-grandson in his struggle for power. If such a combination arose before the end of his reign it was owing more to his omitting to fulfil the duties of his station than from the necessity of the case. As he could talk no English, and his ministers could talk no German, he absented himself from the meetings of the cabinet, and his frequent absences from England and his want of interest in English politics strengthened the cabinet in its tendency to assert an independent position. Walpole at last by his skill in the management of parliament rose as a subject into the almost royal position denoted by the name of prime minister. In connection with Walpole the force of wealth and station established the Whig aristocracy in a point of vantage from which it was afterward difficult to dislodge them. Yet, though George had allowed the power which had been exercised by William and Anne to slip through his hands, it was understood to the last that if he chose to exert himself he might cease to be a mere cipher in the conduct of affairs. As late as in 1727 Bolingbroke gained over one of the king's mistresses, the duchess of Kendal; and though her support of the fallen Jacobite took no effect, Walpole was not without fear that her reiterated entreaties would lead to his dismissal. The king's death in a carriage on his way to Hanover, in the night between June 10th and 11th, in the same year, put an end to these apprehensions.

His only children were his successor George II., and Sophia Dorothea (1687-1757), who married in 1706 Frederick William, crown prince (afterward king) of Prussia. She was the mother of Frederick the Great.

GEORGE II. (*George Augustus*), the only son of George I., was born in 1683. In 1705 he married Wilhelmina Caroline of Anspach. In 1706 he was created earl of Cambridge. In 1708 he fought bravely at Oudenarde. At his father's accession to the English throne he was thirty-one years of age. He

was already on bad terms with his father. The position of an heir-apparent is in no case an easy one to fill with dignity, and the ill treatment of the prince's mother by his father was not likely to strengthen in him a reverence for paternal authority.

When George I. died in 1727, it was generally supposed that Walpole would be at once dismissed. The first direction of the new king was that Sir Spencer Compton would draw up the speech in which he was to announce to the privy council his accession. Compton, not knowing how to set about his task, applied to Walpole for aid. The queen took advantage of this evidence of incapacity, advocated Walpole's cause with her husband, and procured his continuance in office. This curious scene was indicative of the course likely to be taken by the new sovereign. His own mind was incapable of rising above the merest details of business. He made war in the spirit of a drill-sergeant, and he economized his income with the minute regularity of a clerk. A blunder of a master of the ceremonies in marshaling the attendants on a levee put him out of temper. He took the greatest pleasure in counting his money piece by piece, and he never forgot a date. He was above all things methodical and regular.

Though in his domestic relations he was as loose a liver as his father had been, he allowed himself to be guided by the wise but unobtrusive counsels of his wife until her death in 1737, and when once he had recognized Walpole's superiority he allowed himself to be guided by the political sagacity of the great minister. It is difficult to exaggerate the importance of such a temper upon the development of the constitution. The apathy of the nation in all but the most exciting political questions, fostered by the calculated conservatism of Walpole, had thrown power into the hands of the great land-owners. They maintained their authority by supporting a minister who was ready to make use of corruption, wherever corruption was likely to be useful, and who could veil over the baseness of the means which he employed by his talents in debate and finance. To shake off a combination so strong would not have been easy. George II. submitted to it without a struggle.

The years which followed settled conclusively, at least for this reign, the constitutional question of the power of appointing ministers. The war between Spain and England had broken out in 1739. In 1741 the death of the emperor Charles VI. brought on the war of the Austrian succession. The position of George II. as a Hanoverian prince drew him to the side of Maria Theresa through jealousy of the rising Prussian monarchy. Jealousy of France led England in the same direction, and in 1741 a subsidy of £300,000 was voted to Maria Theresa. The king himself went to Germany and attempted to carry on the war according to his own notions. Those notions led him to regard the safety of Hanover as of far more importance than the wishes of England. Finding that a French army was about to march upon his German states, he concluded with France a treaty of neutrality for a year without consulting a single English minister. In England the news was received with feelings of disgust. The expenditure of English money and troops was to be thrown uselessly away as soon as it appeared that Hanover was in the slightest danger. In 1742 Walpole was no longer in office. Lord Wilmington, the nominal head of the ministry, was a mere cipher. The ablest and most energetic of his colleagues, Lord Carteret, attached himself specially to the king, and sought to maintain himself in power by his special favor and by brilliant achievements in diplomacy.

In part at least by Carteret's mediation the peace of

Breslau was signed, by which Maria Theresa ceded Silesia to Frederick (July 28, 1742). Thus relieved on her northern frontier, she struck out vigorously toward the west. Bavaria was overrun by her troops. In the beginning of 1743 one French army was driven across the Rhine. On June 27th another French army was defeated by George II. in person at Dettingen. Victory brought elation to Maria Theresa. Her war of defense was turned into a war of vengeance. Bavaria was to be annexed. The French frontier was to be driven back. George II. and Carteret after some hesitation placed themselves on her side. Of the public opinion of the political classes in England they took no thought. Hanoverian troops were indeed to be employed in the war, but they were to be taken into British pay. Collisions between British and Hanoverian officers were frequent. A storm arose against the preference shown to Hanoverian interests. After a brief struggle Carteret, having become Lord Granville by his mother's death, was driven from office in November, 1744.

Henry Pelham, who had become prime minister in the preceding year, thus saw himself established in power. By the acceptance of this ministry, the king acknowledged that the function of choosing a ministry and directing a policy had passed from his hands. In 1745 indeed he recalled Granville, but a few days were sufficient to convince him of the futility of his attempt, and the effort to exclude Pitt at a later time proved equally fruitless.

Important as were the events of the remainder of the reign, therefore, they can hardly be grouped round the name of George II. The resistance to the invasion of the young Pretender in 1745, the peace of Aix-la-Chapelle in 1748, the great war ministry of Pitt at the close of the reign, did not receive their impulse from him. He had indeed done his best to exclude Pitt from office. He disliked him on account of his opposition in former years to the sacrifices demanded by the Hanoverian connection. When in 1756 Pitt became secretary of state in the Devonshire administration, the king bore the yoke with difficulty. Early in the next year he complained of Pitt's long speeches as being above his comprehension, and on April 5, 1757, he dismissed him, only to take him back shortly after, when Pitt, coalescing with Newcastle, became master of the situation. Before Pitt's dismissal George II. had for once an opportunity of placing himself on the popular side, though, as was the case of his grandson during the American war, it was when the popular side happened to be in the wrong. In the true spirit of a martinet, he wished to see Admiral Byng executed. Pitt urged the wish of the House of Commons to have him pardoned. "Sir," replied the king, "you have taught me to look for the sense of my subjects in another place than in the House of Commons." When George II. died, in 1760, he left behind him a settled understanding that the monarchy was one of the least of the forces by which the policy of the country was directed. To this end he had contributed much by his disregard of English opinion in 1743; but it may fairly be added that, but for his readiness to give way to irresistible adversaries, the struggle might have been far more bitter and severe than it was.

Of the connection between Hanover and England in this reign two memorials remain more pleasant to contemplate than the records of parliamentary and ministerial intrigues. With the support of George II., amidst the derision of the English fashionable world, the Hanoverian Handel produced in England those masterpieces which have given delight to millions, while the foundation of the university of Göttingen by the same king opened a door through which English

political ideas afterward penetrated into Germany. George II. had three sons and five daughters.

GEORGE III. (*George William Frederick*), born June 4, 1738, was the son of Frederick prince of Wales and the grandson of George II., whom he succeeded in 1760. After his father's death in 1751 he had been educated in seclusion from the fashionable world under the care of his mother, and of her favorite counselor the earl of Bute. He had been taught to revere the maxims of Bolingbroke's *Patriot King*, and to believe that it was his appointed task in life to break the power of the Whig houses resting upon extensive property and the influence of patronage and corruption.

That power had already been gravely shaken. The Whigs from their incompetency were obliged when the Seven Years' War broke out to leave its management in the hands of William Pitt. The nation learned to applaud the great war minister who succeeded where others had failed, and whose immaculate purity put to shame the ruck of barterers of votes for places and pensions. In some sort the work of the new king was the continuation of the work of Pitt. But his methods were very different. He did not appeal to any widely spread feeling or prejudice; nor did he disdain the use of the arts which had maintained his opponents in power. As the first English-born sovereign of his house, speaking from his birth the language of his subjects, he found a way to the hearts of many who never regarded his predecessors as other than foreign intruders. The contrast, too, between the pure domestic life which he led with his wife Charlotte of Mecklenburg-Strelitz, whom he married in 1761, and the habits of three generations of his house, told in his favor with the vast majority of his subjects.

At first everything seemed easy to him. Pitt had come to be regarded by his own colleagues as a minister who would pursue war at any price, and in getting rid of Pitt in 1761 and in carrying on the negotiations which led to the peace of Paris in 1762, the king was able to gather round him many persons who would not be willing to acquiesce in any permanent change in the system of government. With the signature of the peace his real difficulties began. The Whig houses, indeed, were divided among themselves by personal rivalries. But they were none of them inclined to let power and the advantages of power slip from their hands without a struggle. For some years a contest of influence was carried on without dignity and without any worthy aim. The king was not strong enough to impose upon parliament a ministry of his own choice. But he gathered round himself a body of dependants known as the king's friends, who were secure of his favor, and who voted one way or the other according to his wishes. Under these circumstances no ministry could possibly be stable; and yet every ministry was strong enough to impose some conditions on the king. Lord Bute, the king's first choice, resigned from a sense of his own incompetency in 1763. George Grenville was in office till 1765; the marquis of Rockingham till 1766; Pitt, becoming earl of Chatham, till illness compelled him to retire from the conduct of affairs in 1767, when he was succeeded by the duke of Grafton. But a struggle of interests could gain no real strength for any government, and the only chance the king had of effecting a permanent change in the balance of power lay in the possibility of his associating himself with some phase of strong national feeling, as Pitt had associated himself with the war feeling caused by the dissatisfaction spread by the weakness and inaptitude of his predecessors.

Such a chance was offered by the question of the right to tax America. The notion that England was justified

in throwing on America part of the expenses caused in the late war was popular in the country, and no one adopted it more pertinaciously than George III. At the bottom the position which he assumed was as contrary to the principles of parliamentary government as the encroachments of Charles I. had been. There were thousands of people in England to whom it never occurred that there was any good reason why a British parliament should be allowed to levy a duty on tea in the London docks and should not be allowed to levy a duty on tea at the wharves of Boston. Undoubtedly George III. derived great strength from his honest participation in this mistake. Contending under parliamentary forms, he did not wound the susceptibilities of members of parliament, and when at last in 1770 he appointed Lord North—a minister of his own selection—prime minister, the object of his ambition was achieved with the concurrence of a large body of politicians who had nothing in common with the servile band of the king's friends.

As long as the struggle with America was carried on with any hope of success they gained that kind of support which is always forthcoming to a government which shares in the errors and prejudices of its subjects. The expulsion of Wilkes from the House of Commons in 1769, and the refusal of the House to accept him as a member after his reelection, raised a grave constitutional question in which the king was wholly in the wrong; and Wilkes was popular in London and Middlesex. But his case roused no national indignation, and when in 1774 those sharp measures were taken in Boston which led to the commencement of the American rebellion in 1775, the opposition to the course taken by the king made little way either in parliament or in the country. Burke might point out the folly and inexpediency of the proceedings of the government. Chatham might point out that the true spirit of English government was to be representative, and that that spirit was being violated at home and abroad. George III., who thought that the first duty of the Americans was to obey himself, had on his side the mass of unreflecting Englishmen who thought that the first duty of all colonists was to be useful and submissive to the mother country. The natural dislike of every country engaged in war to see itself defeated was on his side, and when the news of Burgoyne's surrender at Saratoga arrived in 1777, subscriptions of money to raise new regiments poured freely in.

In March, 1778, the French ambassador in London announced that a treaty of friendship and commerce had been concluded between France and the new United States of America. Lord North was anxious to resign power into stronger hands, and begged the king to receive Chatham as his prime minister. The king would not hear of it. He would have nothing to say to "that perfidious man" unless he would humble himself to enter the ministry as North's subordinate. Chatham naturally refused to do anything of the kind, and his death in the course of the year relieved the king of the danger of being again overruled by too overbearing a minister. England was now at war with France, and in 1779 she was also at war with Spain.

George III. was still able to control the disposition of office. He could not control the course of events. His very ministers gave up the war with America as hopeless long before he would acknowledge the true state of the case. Before the end of 1779, two of the leading members of the cabinet, Lords Gower and Weymouth, resigned rather than bear the responsibility of so ruinous an enterprise as the attempt to overpower America and France together. Lord North retained office, but he acknowledged to the king that his own

opinion was precisely the same as that of his late colleagues.

The year 1780 saw an agitation rising in the country for economical reform, an agitation very closely though indirectly connected with the war policy of the king. The public meetings held in the country on this subject have no unimportant place in the development of the constitution. Since the presentation of the Kentish Petition, in the reign of William III., there had been from time to time upheavings of popular feeling against the doings of the legislature, which kept up the tradition that parliament existed in order to represent the nation. But these upheavings had all been so associated with ignorance and violence as to make it very difficult for men of sense to look with displeasure upon the existing emancipation of the House of Commons from popular control. The Sacheverell riots, the violent attacks upon the Excise Bill, the no less violent advocacy of the Spanish war, the declamations of the supporters of Wilkes at a more recent time, and even in this very year the Gordon riots, were not likely to make thoughtful men anxious to place real power in the hands of the classes from whom such exhibitions of folly proceeded. But the movement for economical reform was of a very different kind. It was carried on soberly in manner, and with a definite practical object. It asked for no more than the king ought to have been willing to concede. It attacked useless expenditure upon sinecures and unnecessary offices in the household, the only use of which was to spread abroad corruption among the upper classes. George III. could not bear to be interfered with at all, or to surrender any element of power which had served him in his long struggle with the Whigs. He held out for more than another year. The news of the capitulation of York-Town reached London on November 25, 1781. On March 20, 1782, Lord North resigned.

George III. accepted the consequences of defeat. He called the marquis of Rockingham to office at the head of a ministry composed of pure Whigs and of the disciples of the late earl of Chatham, and he authorized the new ministry to open negotiations for peace. Their hands were greatly strengthened by Rodney's victory over the French fleet, and the failure of the combined French and Spanish attack upon Gibraltar; and before the end of 1782 a provisional treaty was signed with America, preliminaries of peace with France and Spain being signed early in the following year. On September 3, 1783, the definitive treaties with the three countries were simultaneously concluded.

Long before the signature of the treaties, Rockingham died (July 1, 1782). The king chose Lord Shelburne, the head of the Chatham section of the government, to be prime minister. Fox and the followers of Rockingham refused to serve except under the duke of Portland, a minister of their own selection, and resigned office. The old constitutional struggle of the reign was now to be fought out once more. Fox, too weak to obtain a majority alone, coalesced with Lord North, and defeated Shelburne in the House of Commons on February 17, 1783. On April 2d the coalition took office, with Portland as nominal prime minister, and Fox and North, the secretaries of state, as its real heads.

This attempt to impose upon him a ministry which he disliked made the king very angry. But the new cabinet had a large majority in the House of Commons, and the only chance of resisting it lay in an appeal to the country against the House of Commons. Such an appeal was not likely to be responded to unless the ministers discredited themselves with the nation. George III. therefore waited his time. Though a coalition between men bitterly opposed to one another in all politi-

cal principles and drawn together by nothing but love of office was in itself discreditable, it needed some more positive cause of dissatisfaction to arouse the constituencies, which were by no means so ready to interfere in political disputes at that time as they are now. Such dissatisfaction was given by the India Bill, drawn up by Burke. As soon as it had passed through the Commons the king hastened to procure its rejection in the House of Lords by his personal intervention with the peers. He authorized Lord Temple to declare in his name that he would count any peer who voted for the Bill as his enemy. On December 17, 1783, the Bill was thrown out. The next day ministers were dismissed. William Pitt (the younger) became prime minister. After some weeks' struggle with a constantly decreasing majority in the Commons, the king dissolved parliament on March 25, 1784. The country rallied round the crown and the young minister, and Pitt was firmly established in office.

Of the glories of Pitt's ministry this is not the place to write. That the king gained credit by them far beyond his own deserts is beyond a doubt. Nor can there be any reasonable doubt that his own example of domestic propriety did much to strengthen the position of his minister. It is true that that life was insufferably dull. No gleams of literary or artistic taste lightened it up. The dependants of the court became inured to dull routine, unchequered by loving sympathy. The sons of the household were driven by the sheer weariness of such an existence into the coarsest profligacy. But all this was not visible from a distance. The tide of moral and religious improvement which had set in in England since the days of Wesley brought popularity to a king who was faithful to his wife, in the same way that the tide of manufacturing industry and scientific progress brought popularity to the minister who in some measure translated into practice the principles of the *Wealth of Nations*.

The life of the king was suddenly clouded over. Early in his reign, in 1765, he had been out of health, and it is now known — what was studiously concealed at the time — that symptoms of mental aberration were even then to be perceived. In October, 1788, he was again out of health, and in the beginning of the following month his insanity was beyond a doubt. While Pitt and Fox were contending in the House of Commons over the terms on which the regency should be committed to the prince of Wales, the king was a helpless victim to the ignorance of physicians and the brutalities of his servants. At last Doctor Willis, who had made himself a name by prescribing gentleness instead of rigor in the treatment of the insane, was called in. Under his more humane management the king rapidly recovered. Before the end of February, 1789, he was able to write to Pitt thanking him for his warm support of his interests during his illness. On April 23d he went in person to St. Paul's to return thanks for his recovery.

The popular enthusiasm which burst forth around St. Paul's was but a foretaste of a popularity far more universal. The French Revolution frightened the great Whig land-owners till they made their peace with the king. Those who thought that the true basis of government was aristocratical were now of one mind with those who thought that the true basis of government was monarchical; and these two classes were joined by a far larger multitude which had no political ideas whatever, but which had a moral horror of the guillotine. As Elizabeth had once been the symbol of resistance to Spain, George was now the symbol of resistance to France. He was not, however, more than the symbol. He allowed Pitt to levy taxes and incur debt, to launch

armies to defeat, and to prosecute the English imitators of French revolutionary courses. At last, however, after the Union with Ireland was accomplished, he learned that Pitt was planning a scheme to relieve the Catholics from the disabilities under which they labored. The plan was revealed to him by the chancellor, Lord Loughborough, a selfish and intriguing politician who had served all parties in turn, and who sought to forward his own interest by falling in with the king's prejudices. George III. at once took up the position from which he never swerved. He declared that to grant concessions to the Catholics involved a breach of his coronation oath. All thinking men of a later generation are of opinion that the objection was untenable. But no one has ever doubted that the king was absolutely convinced of the serious nature of the objection, or that he believed the measure itself to be beyond calculation injurious to church and state. Nor can there be any doubt that he had the English people behind him. Both in his peace ministry and in his war ministry Pitt had taken his stand on royal favor and on popular support. Both failed him alike now, and he resigned office at once. The shock to the king's mind was so great that it brought on a fresh attack of insanity. This time, however, the recovery was rapid. On March 14, 1801, Pitt's resignation was formally accepted, and the late speaker, Mr. Addington, was installed in office as prime minister.

The king was well pleased with the change. He was never capable of appreciating high merit in any one; and he was unable to perceive that the question on which Pitt had resigned was more than an improper question, with which he ought never to have meddled. Addington was a minister after his own mind. Thoroughly honest and respectable, with about the same share of abilities as was possessed by the king himself, he was certainly not likely to startle the world by any flights of genius. But for one circumstance, Addington's ministry would have lasted long. So strong was the reaction against the Revolution, that the bulk of the nation was almost as suspicious of genius as the king himself. Not only was there no outcry for legislative reforms, but the very idea of reform was unpopular. The country gentlemen were predominant in parliament, and the country gentlemen, as a body, looked upon Addington with respect and affection. Such a minister was, therefore, admirably suited to preside over affairs at home in the existing state of opinion. But those who were content with inaction at home, would not be content with inaction abroad. In time of peace, Addington would have been popular for a season. In time of war, even his warmest admirers could not say that he was the man to direct armies in the most terrible struggle which had ever been conducted by an English government.

For the moment this difficulty was not felt. On October 1, 1801, preliminaries of peace were signed between England and France, to be converted into the definitive peace of Amiens on March 27, 1802. The ruler of France was now Napoleon Bonaparte, and few persons in England believed that he had any real purpose of bringing his aggressive violence to an end. "Do you know what I call this peace?" said the king; "an experimental peace, for it is nothing else. But it was unavoidable."

The king was right. On May 18, 1803, the declaration of war was laid before parliament. The war was accepted by all classes as inevitable, and the French preparations for an invasion of England roused the whole nation to a glow of enthusiasm only equalled by that felt when the Armada threatened the British shores. On October 26th, the king reviewed the London volunteers in Hyde Park. He found himself the

center of a great national movement with which he heartily sympathized, and which heartily sympathized with him.

On February 12, 1804, the king's mind was again affected. When he recovered, he found himself in the midst of a ministerial crisis. Public feeling allowed but one opinion to prevail in the country — that Pitt, not Addington, was the proper man to conduct the administration in time of war. Pitt was anxious to form an administration on a broad basis, including Fox and all prominent leaders of both parties. The king would not hear of the admission of Fox. His dislike of him was personal as well as political, as he knew that Fox had had a great share in drawing the prince of Wales into a life of profligacy. Pitt accepted the king's terms, and formed an administration in which he was the only man of real ability. Eminent men such as Lord Grenville refused to join a ministry from which the king had excluded a great statesman on purely personal grounds.

The whole question was reopened on Pitt's death on January 23, 1806. This time the king gave way. The ministry of All the Talents, as it was called, included Fox among its members. At first the king was observed to appear depressed at the necessity of surrender. But Fox's charm of manner soon gained upon him. On September 13th, Fox died, and it was not long before the king and the ministry were openly in collision. The ministry proposed a measure enabling all subjects of the crown to serve in the army and navy in spite of religious disqualifications. The king objected even to so slight a modification of the laws against the Catholics and Dissenters, and the ministers consented to drop the bill. The king asked more than this. He demanded a written and positive engagement that this ministry would never, under any circumstances, propose to him "any measure of concession to the Catholics, or even connected with the question." The ministers very properly refused to bind themselves for the future. They were consequently turned out of office, and a new ministry was formed with the duke of Portland as first lord of the treasury and Mr. Perceval as its real leader. The spirit of the new ministry was distinct hostility to the Catholic claims. On April 27, 1807, a dissolution of parliament was announced, and a majority in favor of the king's ministry was returned in the elections which speedily followed.

The elections of 1807, like the elections of 1784, gave the king the mastery of the situation. In other respects they were the counterpart of one another. In 1784 the country declared, though perhaps without any clear conception of what it was doing, for a wise and progressive policy. In 1807 it declared for an unwise and retrogressive policy, with a very clear understanding of what it meant. It is in his reliance upon the prejudices and ignorance of the country that the constitutional significance of the reign of George III. appears. Every strong government derives its power from its representative character. At a time when the House of Commons was less really representative than at any other, a king was on the throne who represented the country in its good and bad qualities alike, in its hatred of revolutionary violence, its moral sturdiness, its contempt of foreigners, and its defiance of all ideas which were in any way strange. Therefore it was that his success was not permanently injurious to the working of the constitution as the success of Charles I. would have been. If he were followed by a king less English than himself, the strength of representative power would pass into other hands than those which held the scepter.

The overthrow of the ministry of All the Talents was the last political act of constitutional importance in which George III. took part. The substitution of

Perceval for Portland as the nominal head of the ministry in 1809 was not an event of any real significance, and in 1811 the reign practically came to an end. The king's reason finally broke down after the death of the Princess Amelia, his favorite child. The remaining nine years of his life were passed in insanity and blindness, and when he died on January 29, 1820, in his eighty-second year, no political results were to be anticipated. George III. had nine sons and six daughters.

GEORGE IV. (*George Augustus Frederick*), lived long enough to strip the crown of the leadership of the nation which his father had won for it. Born on August 12, 1762, he was noted in the years of his early manhood for good looks, for ease of carriage, and graciousness of manner. He soon plunged into the whirl of sensual excitement. His life was passed in the grossest profligacy. He was false as well as licentious. His word was never to be trusted. Not even an occasional gleam of brightness lights up the dark picture of his career.

The prince fell in love with Mrs. Fitzherbert who had been twice a widow at twenty-five. She was ready to marry him, but she would yield to him on no other terms. She was a Roman Catholic, and a marriage of the heir of the crown with a Roman Catholic forfeited his succession by the Act of Settlement. Mrs. Fitzherbert, holding that the performance of the ceremony by a priest of her church was of sacramental efficacy, was indifferent to the legality of the proceeding. The marriage took place.

In 1795 the prince married Caroline of Brunswick, because his father would not pay his debts on any other terms. Her behavior was light and flippant, and he was brutal and unloving. The ill-assorted pair soon parted, and soon after the birth of their only child, the Princess Charlotte, they were formally separated. In 1811 the prince at last became regent in consequence of his father's definite insanity. The disgust which his profligate and uxorious life caused among a people suffering from almost universal distress after the conclusion of the war of 1815 rapidly increased. In 1817 the windows of the prince regent's carriage were broken as he was on his way to open parliament.

The death of George III. on January 29, 1820, gave to his son the title of king without in any way altering the position which he had now held for nine years. The relations between the new king and his wife unavoidably became the subject of public discussion. The accession of George IV. brought matters to a crisis. He ordered that no prayer for his wife as queen should be admitted into the Prayer Book. She at once challenged the accusation which was implied in this omission by returning to England. On June 7 she arrived in London. Before she left the Continent she had been informed that proceedings would be taken against her for adultery if she landed in England. Two years before, in 1818, commissioners had been sent to Milan to investigate charges against her, and their report, laid before the cabinet in 1819, was made the basis of the prosecution. On the day on which she arrived in London a message was laid before both houses recommending the criminating evidence to parliament. A secret committee in the House of Lords, after considering this evidence, brought in a report on which the prime minister founded a Bill of Pains and Penalties to divorce the queen and to deprive her of her royal title. The Bill passed the three readings with diminished majorities, and when on the third reading it obtained only a majority of nine, it was abandoned by the Government. The king's unpopularity, great as it had been before, was now greater than ever. Public opinion, without troubling itself to ask whether the queen was guilty or

not, was roused to indignation by the spectacle of such a charge being brought by a husband who had thrust away his wife to fight the battle of life alone, without protection or support, and who, while surrounding her with spies to detect, perhaps to invent, her acts of infidelity, was himself living in notorious adultery. In the following year (1821) she attempted to force her way into Westminster Abbey to take her place at the coronation. On this occasion the popular support failed her; and her death not long afterward relieved the king from further annoyance. George IV. died on June 26, 1830.

GEORGE OF CAPPADOCIA, who from 356 to 361 was Arian archbishop of Alexandria, was born about the beginning of the fourth century. According to Ammianus he was a native of Epiphania in Cilicia; but universal tradition makes him a Cappadocian.

GEORGE, SAINT, according to Metaphrastes, the Byzantine hagiologist, whose narrative is substantially repeated in the Roman *Acta Sanctorum* and in the Spanish breviary, was born in Cappadocia. He suffered martyrdom in 303 A. D.

The popularity of the name of St. George in England dates from the time of Richard Cœur de Lion, who, it was said, had successfully invoked his aid during the first crusade; but it was not till the time of Edward III. that he was made patron of the kingdom, although at the council of Oxford, in 1222, it had already been ordered that his feast should be kept as a national festival. The republics of Genoa and Venice were also under his protection; and his name is much revered in all the Oriental churches.

GEORGE, known as PISIDES or PISIDA, a Byzantine writer of the seventh century, was, as his surname implies, a native of Pisidia; but of his personal history nothing is known, except that he had been ordained a deacon, and that he held, either simultaneously or successively, several offices in the "Great Church" (that of St. Sophia) at Constantinople.

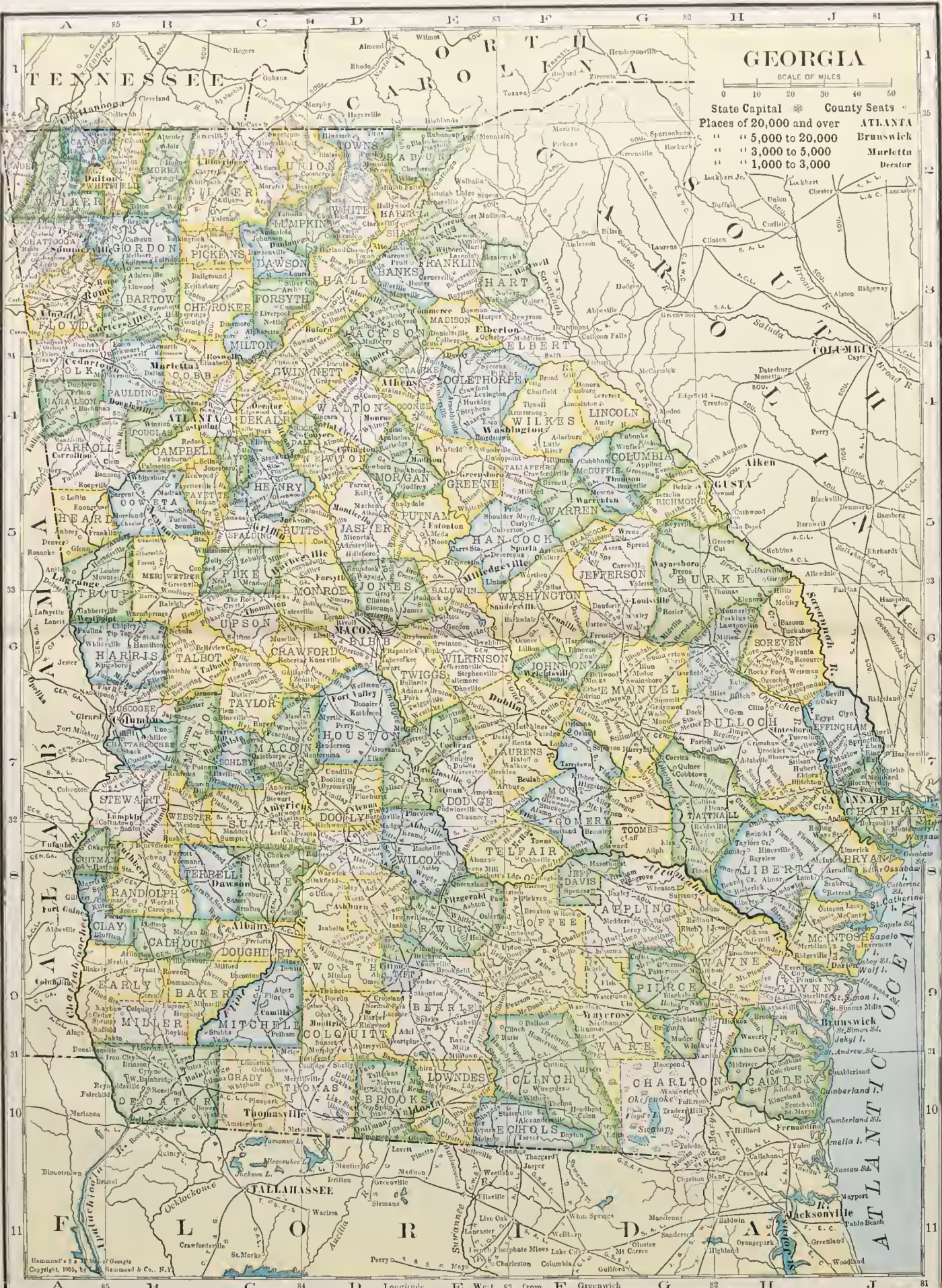
GEORGE, OF TREBIZOND, one of the distinguished writers in the great controversy between Aristotelianism and Platonism, in the fifteenth century, was born at Chandace, in the island of Crete, in 1396, and died at Rome in 1486.

GEORGETOWN, formerly a city of the District of Columbia, of which it was the port of entry, has, since 1878, been incorporated in the city of Washington, under which head it will be treated.

GEORGETOWN, known as Stabroek during the Dutch period, now the capital of British Guiana, is situated in the county of Demerara on the east bank of the Demarara river, about a mile from its mouth. It is one of the prettiest towns of that part of the world, and presents an unusually attractive appearance to the approaching voyager. Population (1902) about 60,000.

GEORGIA, a kingdom in Central Transcaucasia, remarkable for the long list of its sovereigns, the monarchy having extended over a period of upward of 2,000 years, the kings reigning at times independently, or under the rule of Persia, Turkey, or the Eastern empire. The earliest name of the country was Karthli; the ancients knew it as Iberia, bounded on the one side by Colchis and on the other by Albania; and it has for centuries been called Georgia.

Georgia proper, which includes Karthli and Kakhetia, is bounded on the north by Ossety and Daghestan, on the east by Shekynn, on the south by Shamshadyl and the khanates of Erivan and Kars, and on the west by Gouria and Imeritia; but the kingdom at times included Gouria, Mingrelia, Abkhasia, Imeritia, and Daghestan, and extended from the great mountain range to the Araxes. It now forms the government of Tiflis, divided



GEORGIA

SCALE OF MILES
0 10 20 30 40 50

State Capital	County Seats
Places of 20,000 and over	ATLANTA
" " 5,000 to 20,000	Brunswick
" " 3,000 to 5,000	Marbleton
" " 1,000 to 3,000	Denton

into the districts of Doushett, Telav, Sygnah, Gori, and Akhalzikh, having an area of nearly 25,000 square miles, and in 1899 a population of 700,000, made up chiefly of Georgians and Armenians—there being also Persians, Tartars, and a few Jews and Europeans. The chief city is the ancient capital of Tiflis, the seat of government, under a governor general, for the whole of Transcaucasia. Pop. of Tiflis (1898), 160,645.

The valleys and declivities are fertile, producing maize, millet, barley, oats, rice, beans, lentils, and corn, also cotton, flax, and hemp, now exported exclusively to Russia. The vineyards cover 75,400 acres, the average produce of wine being at the rate of 230 gallons per acre; the valley of the Alazan yields the best qualities.

The domestic animals are the camel, ox, mule, ass, and buffalo as beasts of burden, with the goat, and an immense number of pigs, pork being favorite food. The horse—small, hardy, and enduring—is ridden, more frequently unshod, except in the hills, no pains are taken to improve the breed. The wild animals of greatest importance are bear, ibex, wolf, hyena, fox, wild boar, wild goat, and antelope; while the pheasant, woodcock, quail, and "partridge of the Caucasus" are the principal winged game. The fish taken in the Kour and other rivers are the sturgeon, silurus, carp, perch, trout, gudgeon, and a fish resembling the salmon, called *oragoula* by the Georgians. The great sturgeon, *belouga* or hansen, is taken at the estuary of the Kour in the Caspian.

History.—The material at the disposal of the historian of Georgia is scanty. An anonymous work of the twelfth century gives the history from the earliest times to the year 1124; another, also anonymous, is a continuation to the division of the kingdom in 1445; and a third is the compilation by the Czarevitch Wakhoucht, being the complete annals from the earliest times to the year 1745. These, and a few pamphlets indifferently edited, if we except the memoirs of his family by Stephen Orbeliani, archbishop of Siouny in the thirteenth century, comprise all that is left to us during an interval of upward of 2,000 years.

Ethnology.—Of the three main groups into which the Caucasian races are now usually divided, the Georgian is in every respect the most important and interesting. It has accordingly largely occupied the attention of Orientalists almost incessantly from the days of Klaproth to the present time. Yet such are the difficulties connected with the origin and mutual relations of the Caucasian peoples that its affinities are still far from being clearly established.

The Georgian race, which represents the oldest elements of civilization in the Caucasus, is distinguished by some excellent mental qualities, and is especially noted for personal courage and a passionate love of music. The people, however, are described as fierce and cruel, and addicted to the vice of intemperance, though Von Thielmann speaks of them as "rather hard drinkers than drunkards." Physically they are a fine athletic race of pure Caucasian type; hence during the Moslem ascendancy Georgia supplied, next to Circassia, the largest number of female slaves for the Turkish harems and of recruits for the Osmanli armies, more especially for the select corps of the famous Mameluks.

The social organization rested on a highly aristocratic basis, and the lowest classes were separated by several grades of vassalage from the highest. But since their incorporation with the Russian empire, these relations have become greatly modified, and a more sharply defined middle class of merchants, traders, and artisans has been developed. The power of life and death, formerly claimed and freely exercised by the nobles over their serfs, has also been expressly abolished. They

are altogether at present in a fairly well-to-do condition, and it cannot be denied that under the Russian administration they have become industrious, and have made considerable moral and material progress.

Missionaries sent by Constantine the Great introduced Christianity about the beginning of the fourth century. Their efforts were greatly aided by the exemplary life of a female slave named Nina, who came into Georgia during the reign of King Miriam (265–318), and who occupies a prominent place in the ecclesiastical records of the country. Since that time the people have, under severe pressure from surrounding Mahometan communities, remained faithful to the principles of Christianity, and are still among the most devoted adherents of the orthodox Greek Church. Indeed it was their attachment to the national religion that caused them to call in the aid of the Christian Muscovites against the proselytizing attempts of the Shiite Persians—a step which ultimately brought about their political extinction.

GEORGIA, one of the South Atlantic States of the American Union, is bounded on the north by Tennessee and North Carolina; on the east by South Carolina and the Atlantic Ocean; on the south by Florida, and on the west by Alabama. The early history of Georgia is widely different from that of the other twelve colonies—itself forming one of the original thirteen. Its inception was different and it was peopled by a different class of immigrants—being the only one of the colonies in which the government of England took a patronizing and fostering interest. The other colonies were the results of individual enterprise, while the settlement of Georgia was an affair in which the government participated and to which it gave aid. The first English settlement in the State was made in 1733, by a band of immigrants under the direction of Gen. James Oglethorpe, who first landed at Savannah in February of that year. Other settlements were made by the English at Darien, St. Simon and Augusta. By 1736 the colony had grown considerably, having received additions from England and other European countries. The early prosperity of the colony was somewhat disturbed by the war between the English and Spaniards, which latter nation had already taken possession of Florida and also claimed Georgia. The English were victorious, however, and succeeded in putting a quietus to all attempts of the Spaniards to make good their claim to the territory occupied by Oglethorpe's colonists. The relations between the Indians (of whom there were two powerful tribes—the Cherokees and the Creeks) and the settlers at first were amicable, and were never disturbed until the French and Indian war, during which the Cherokees plundered and burned some of the remote frontier hamlets and killed a few of the settlers. After remaining under the rule of a board of trustees for a period of nineteen years the government of the colony was transferred to the home administration and a royal governor and council were appointed to administer the affairs of the colony. The extent of the territory comprised in the original colony was much greater than the area of the present State, and by treaty with France and Spain at one time it extended to the Mississippi river on the west and included a goodly portion of Florida on the south.

When the revolutionary war began, Georgia was in a flourishing condition, having a population, including negroes (slavery having been introduced in 1750), estimated at over 75,000. She immediately took part in the struggle, and her representatives were among the signers of the declaration of independence. The State was destined to become the scene of important military operations during the progress of the war, and several hard-fought battles between the British on the one side,

and the French and Americans on the other, took place, those of greatest magnitude being at Augusta and Savannah. Although defeated and compelled to abandon Augusta at first, the British recaptured the town, and held Savannah and the entire State in subjection (with the exception of minor guerrilla warfare) until General Greenesucceeded in forcing them to retire, in 1782, after the surrender of Cornwallis, and before the signing of the treaty of peace between England and America. Several years after her entrance into the sisterhood of States, Georgia discarded the constitution which she had originally ratified in 1777. In 1798 she adopted a third constitution, which, with various amendments added, was the instrument in force until after the rebellion. In 1803 two new territories were erected out of her domains, and these were afterward admitted to the union as the States of Mississippi and Alabama, which loss of territory was, in a measure, compensated by possession of the large tract of country before that time occupied by the Creek Indians, who ceded it to the State in 1804. From 1815 to 1825 the troubles between the whites and Indians were of a nature so serious that the general government had to interfere and remove the Indians beyond the Mississippi. The beginning of these troubles lay in the incitement by the British (at that time at war with the United States) of the savages to acts of hostility, and they were only subdued after a desperate conflict with the troops of General Jackson. But the troubles were continually renewed, the Indians assassinating one of their chieftains who had negotiated a treaty ceding lands to the whites, until finally the national government intervened, with the result stated.

When the civil war broke out, in 1861, Georgia followed in the wake of South Carolina, passing the ordinance of secession, being the fifth State in order of priority to leave the Union. Almost immediately her territory became the scene of military operations, the first of any considerable importance being the assault and capture of Fort Pulaski by the United States navy and the subsequent occupation of various other points by Federal troops. After the defeat of the Confederate forces at Chickamauga and Chattanooga the Federal forces, under General Sherman, were pushed rapidly forward against the confederates, who were at Dalton, Ga., and joined battle with them at Resaca, Kingston and Alatoona Pass, and at various other places numerous bloody skirmishes took place. Atlanta fell before the victorious arms of Sherman in September, 1864, and thence that general took up his "march to the sea," appearing before Savannah, December 10, 1864. After two weeks' hard fighting he succeeded in capturing the defenses and occupied the city. After the fall of the Confederacy Jefferson Davis fled to Georgia, and was captured near Macon by a detachment of Federal cavalry, which had previously invaded the State and taken various points of importance.

The history of Georgia, since the war, has been one of steady progress. Hardly had the throes of the great rebellion passed away before the work of reconstruction and rehabilitation began. In the fall of 1865 the first steps were taken, by a convention held at Milledgeville (then the capital of the State), which expunged the ordinance of secession from the statute book, acquiesced in and ratified the emancipation proclamation of the president, and voided all public debts on account of the war. In 1868 a constitution was framed—consisting of portions of the constitution of '98, with numerous and radical amendments—and the State government was organized by the inauguration of Rufus B. Bullock as governor. Five years after the war, Georgia was in full possession of all her rights as a State of the Union, and her reconstruction was complete. At this period

of her history, the condition of the State was appalling, and the future presented a dreary outlook for her; but with unexampled energy and pluck, her people went to work to retrieve their fallen fortunes; and in the year 1891, no Southern State has a brighter future in prospective than Georgia. Her natural resources are enormous, and her productions are varied almost to infinity, and, if properly fostered, will be a source of inexhaustible wealth. Manufactures and agriculture have been rejuvenated, and new enterprises inaugurated. In 1877 a new constitution (the seventh), was adopted, under which the State has progressed in every way, both politically and commercially.

The natural features of the State present almost infinite variety, both as regards its topographical and geological structure. Its total area is about 60,000 square miles, and within these limits may be found representatives of almost all the geological periods of the earth's formation. Its river systems are magnificent, and add greater beauty to a country whose other characteristics are so disposed as to present a grandeur of scenery and variety of productions and climate rarely met with. The State is particularly rich in minerals, nearly every important natural deposit in the catalogue being found in one or the other portion of her domain. Metals from gold to iron abound in large quantities, while stones and rocks of various degrees of value and usefulness, together with coal, await but the necessary capital (of late rapidly forthcoming) to make them available and add to the material prosperity of the people. Its vegetation includes almost the entire range of the temperate and sub-tropical regions, embracing in its flora, sylvia and grasses many of the most valuable, useful and beautiful of each. The climate is equally diversified, and, while in some places—particularly in the alluvions—malarial and unhealthy, yet in the higher lands the air is salubrious and bracing, and the mortality statistics of the country will compare favorably with those of any other State of the Union. The range of the thermometer is very slight, being usually between 95° maximum in summer and 10° minimum in winter; only in exceptionally severe seasons does the mercury sink to the neighborhood of 0, and the severest weather known to occur was only 5° below.

The food crops consist generally of rice, sugar-cane, sweet potatoes and corn, with a moderate supply of wheat. Cotton, hay and various food grasses grow most abundantly, while the ranges of pine and other forests furnish a generous sustenance for stock and swine.

The fruits represented comprise apples, pears, peaches, oranges, lemons, bananas, together with grapes, cherries and other small fruits. Tobacco grows well, while occasionally rye, oats and barley are met with. Peanuts form an important article of agricultural production. But it is to manufactures that Georgia must look for most of her prosperity. These embrace cotton goods, steel, iron, lumber, tar, pitch, turpentine, cottonseed oil, tobacco, machinery, paper, etc., and their estimated value is over \$80,000,000 annually.

Railroad building has exhibited great activity of late years, and the total mileage within the State is 5,791 miles. The Central Railroad has, in addition to its line of road, a fleet of ocean steamships, plying between New York and Philadelphia and Savannah. And there are numerous other lines of steamers touching at various points along the coast. The foreign commerce of the State is of considerable importance, there being three ports of entry within her bounds. Some fishery interests exist, both coastal and river. In 1881, 1887, and 1895 expositions were held at Atlanta, and were great factors in disseminating knowledge in regard to the possibilities

of the region. This city, which about 1868 was made capital of the State, is now the largest in the State, and one of the most beautiful. Pop. (1900), 89,872. The other principal cities of the State are Savannah, Augusta, Macon, Columbus, and Athens.

The public school system of the State is on a firm basis, and efficiently administered, and in points of material prosperity the outlook for Georgia is bright. The population of the State in 1880 was 1,542,180, and the United States census of 1890 gave 1,837,353. The present Governor (1900) is Allen D. Chandler.

The following statistics will be of interest as exhibiting the present condition of the State:

The Comptroller-General in his report for the fiscal year ending Sept. 30, 1900, presents the following figures: Balance in treasury, Oct. 1, 1899, \$438,766; receipts from all sources to Sept. 30, 1900, \$3,542,069; total, \$3,980,835. Total payments by treasurer, \$3,564,700; balance in treasury, Oct. 1, 1900, \$416,135. The assessed value, which in 1879 was \$234,959,548, had increased in 1901 to \$456,347,034. Comparing 1900 with 1899 the increase in the valuation was \$18,788,333, while in the twenty-two years named the increase was in round numbers almost \$221,387,500.

The bonded debt of the State on Jan. 1, 1902, amounted to \$7,631,500, on which the annual interest charge is \$325,800. This includes bonds issued in aid of railroad construction, obligations to the State University, and all other bonded indebtedness of the State.

Provision was made by the legislature of 1887 for gradually reducing the debt by creating a sinking fund for the years 1887 and 1888 and 1897 to 1915, inclusive, thus carrying into effect the clause of the State Constitution, requiring that \$100,000 should be raised each year by taxation, and held as a sinking fund, for the payment of state bonds.

Georgia possesses a flourishing school system. In 1899 the enrollment of school population was: white, 289,127; colored, 179,980, a total of 469,107; being an increase of 21,320 over the previous year. The average attendance was 265,480, also showing a gratifying increase of over 12,000. The receipts of the school fund for 1900 aggregated \$1,951,107, of which \$330,000 was received from tax assessment, \$50,575 from excess tax on taxable property above \$360,000,000; \$150,000 from rental of State railroad and \$71,861 from liquor tax. There was, after paying certain small sums, left \$638,656 to be apportioned, to which \$188,000 must be added on account of receipt from poll-tax, making an available total for school purposes of \$826,656. The gross sum raised by the State for school purposes in 1900 was \$1,683,380.50 and by counties and cities under local laws \$337,814.53, or a total of \$2,021,195.03. Georgia extends her manufacturing industries gratifyingly. In 1900 she had 7,505 establishments, with an aggregate capital of \$89,789,656. Her wage-earners numbered in that year 88,000, whose combined salaries was \$23,600,000. The value for the year of the entire products exceeded \$106,650,000.

The Georgia Academy for the Blind had ninety-one pupils in attendance during the two years, seventy-eight white and thirteen colored. The appropriation for this institution in 1890 was \$16,000. The institution for the Deaf and Dumb has an average attendance of nearly one hundred pupils. In 1900, the population of the State of Georgia was 2,216,331.

GEORGSWALDE, a town of Northern Bohemia, on the borders of Saxony, in the circle of Leitmeritz, about 35 miles east of Dresden, with a station on the North Bohemian railway. Besides Old and New Georgswalde, it comprises Wiesenau and Philippsdorf, the latter a place which, since 1868 has attained celebrity through

the miracles attributed to its image of the Virgin. Georgswalde was founded in the beginning of the 17th century, and ranks as one of the oldest industrial centers of Bohemia, sharing with the neighboring town of Rumburg a reputation of excellent linen. The parish church is a fine building. Population, 1890, 12,000.

GERA, the chief town of the principality of Reuss-Schleiz, stands in a valley on the banks of the White Elster, 35 miles south-west of Leipsic. It has been all rebuilt since a great fire in 1780, and the streets are in general wide and straight, and contain many handsome houses. The principal buildings are the churches of St. Salvador's and St. Trinity, the town hall, the buildings of the imperial bank and of the Gera bank, the music hall and the central hall. Pop. (1900), 45,640.

GERANIUM is the name of a genus of polypetalous exogenous plants, which is taken by botanists as the type of the natural order *Geraniaceae*.

The species of *Geranium* bear the English name of Cranesbill, and consist mostly of herbs, of annual or perennial duration, dispersed throughout the temperate regions of the world. They number nearly a hundred, and bear a considerable family resemblance. The leaves are for the most part palmately-lobed, and the flowers are regular, consisting of five sepals, five imbricating petals, alternating with five glandules at their base, ten stamens, and a beaked ovary. The genus is not without its virtues, *G. maculatum* being the alum-root of North America, used as an astringent in diarrhoea, dysentery, and such like complaints, while the Herb Robert of English hedgesides, *G. Robertianum*, which is both astringent and aromatic, is used as a remedy in nephritic disorders.

GERARD of CREMONA, the mediæval translator of Ptolemy and Avicenna, was born at Cremona, Lombardy, in 1114. His original version of Avicenna's *Canon of Medicine* was the basis of all the very numerous subsequent Latin editions of that well-known work; and the Latin translation by which alone Ptolemy's *Almagest* until the discovery of the original was known to Europe is also ascribed to him. In addition to these, he translated various other treatises in medicine, mathematics, and astronomy, to the number, it is said, of sixty-six; but some of the works with which he has been credited (including the translation of the *Almansorius* of Er-Razi or Rhazes) are more probably due to the later Gerard also called "Cremonensis," but more precisely "de Saponeta." He died in 1187.

GERARD, variously surnamed TUM, TUNC, TENQUE, or THOM, founder of the order of the knights hospitallers of St. John or of Malta, was born at Amalfi about the year 1040. Whether as a soldier or a merchant, he in the course of the latter part of the eleventh century found his way to Jerusalem, where a hospice had for some time existed for the convenience of those who wished to visit the holy places. Of this institution Gerard became guardian or provost at a date not later than 1100; and here he organized that religious order of St. John which received papal recognition from Pascal II., in 1113, by a bull which was renewed and confirmed by Calixtus II. shortly before the death of Gerard, in 1120.

GÉRARD, ÉTIENNE MAURICE, COUNT, a distinguished French general, was born at Damvilliers in the department of Meuse, 1773. After various services under the revolutionary government, the first empire, the restored Bourbons, the second revolutionary government, and the second restoration, he finally accepted office under the republic, and then the second empire, of which he became a senator, and died in April, 1852.

GÉRARD, FRANÇOIS, BARON, was born on May 4,

1770, at Rome, where his father occupied a post in the house of the French Ambassador. At the age of twelve Gérard left Rome with his family for Paris.

Here he perfected himself in the art of painting and executed some famous pictures, and was the recipient of many royal favors. But the exciting scenes of the French revolutions proved too much for him, and he died of fever January 11, 1837.

GÉRARD, JEAN IGNACE ISIDORE, a French caricaturist generally known by the pseudonym of Grandville—the professional name of his grandparents, who were actors—was born at Nancy, September 13, 1803. The work which first established his fame was *Métamorphoses du jour*, published in 1828. He died of mental disease 1847.

GERARD, JOHN, herbalist and surgeon, was born toward the end of 1545, at Nantwich, in Cheshire. He died in February, 1612.

GÉRARD DE NERVAL is the adopted name of Gérard Labrunie, a French litterateur, and that by which he is generally known. The son of an officer in the army, he was born at Paris, May 21, 1808. From 1841 he was subject to periodical attacks of insanity, and he committed suicide by hanging, 1855. The literary style of Gérard is simple and unaffected, and he has a peculiar faculty of giving to his imaginative creations an air of naturalness and reality.

GERASA, the modern GERASH, or JERASH, a city of Palestine, in the Decapolis of Perea, situated amid the mountains of Gilead, at a distance of twenty miles from the Jordan, and twenty-one miles to the north of Philadelphia. Of its origin nothing is known.

GERBA or JERBA, an island off the African coast in the Gulf of Gabes, belonging to the regency of Tunis. It is flat and well wooded with date palms, has an area of 425 square miles, and contains a population of 30,000. Most of the inhabitants are of Berber origin, though a certain proportion have adopted the Arabic language. About 5,000 Jews live apart in villages of their own, and a number of European merchants are settled in the chief town of Haunt-es-Suk for the purposes of trade.

GERBER, ERNST LUDWIG, author of the well-known dictionary of musicians, was born at Sondershausen September 29, 1746. He died at Sondershausen June 30, 1819.

GERBERON, GABRIEL, a Jansenist monk, one of the most diligent students and prolific writers of his century, was born August 12, 1628, at St. Calais, in the department of Sarthe. He died at the abbey of St. Denis on March 29, 1711.

GERBERT. See SILVESTER II.

GERBERT, MARTIN, a catholic prelate and writer on church music, was a descendant of the Gerberts of Hornau, and was born at Horb on the Neckar, Würtemberg, August 12, 1720. He died May 3, 1793.

GERHARD, FRIEDRICH WILHELM EDUARD, a distinguished German archaeologist, was born at Posen, November 29, 1795. He died at Berlin May 12, 1867.

GERHARD, JOHANN, one of the ablest and most learned exponents of Lutheran orthodoxy, was born in Quedlinburg, October 17, 1582. He died on August 20, 1637. Personally he is said to have exhibited a rare combination of all the best elements of the Christian character; the only failing imputed to him by any one decidedly leans to virtue's side—an excessive love of peace.

GERHARDT, CHARLES FREDERIC, was born at Strasburg, August 21, 1816, and died there August 19, 1856. Gerhardt's contributions to chemistry are less discoveries of new facts, than of new ideas which organized and vitalized an inert accumulation of facts. He developed the notion of types of structure and reaction;

he discovered the order of organic compounds, which led him to the doctrine of homologous and other series, and on theoretical grounds he remodeled the whole character of the combining weights upon the two-volume molecular basis. The bare statement, however, of his results give no idea of the lucidity, the wealth of thought, the grasp of the entire subject, which his memoirs and his longer works display.

GERHARDT, PAUL, the greatest hymn-writer of Germany, if not indeed of Europe, was born at Grafenhausen, a small town on the railway between Halle and Wittenberg, in 1606 or 1607—some authorities, indeed, give the date March 12, 1607, but neither the year nor the day is accurately known. In 1668 he was appointed archdeacon of Lübben in the duchy of Saxe-Merseburg, where, after a somewhat somber ministry of eight years, he died on June 7, 1676.

GERICAULT, JEAN LOUIS ANDRÉ THÉODORE, French painter, who led the inevitable reaction which set in under the empire against the fixed and strictly limited aims of the school of David, was born at Rouen in 1791. On January 26, 1824, he died at the age of thirty-three. That which he left us is effective only as a protest; his work, like his life, lacked the fixity of conscious purpose necessary to the task of reconstruction. Had he stadiad himself and survived the abuse of his powers, he might have played an important part in determining the course of the modern school, for, though no colorist, he was in other respects richly endowed, and was possessed by a rare energy which redeemed even that tendency to undue emphasis which gives a theatrical character to much of the best French work.

GERIZIM ("the desert hill," or, according to others, "the hill of the Gerizzites"), the third highest mountain of Samaria, is situated at the western extremity of the fertile plain of Mochna, and with Mount Ebal, which lies immediately to the north, forms a narrow valley in which lies the ancient town of Sichem or Shechem.

GERMAN CATHOLICS, the name assumed in Germany toward the close of the year 1844 by certain dissentients from the church of Rome. The most prominent leader of the German Catholic movement was Johann Ronge, a Roman Catholic priest, who in October, 1844, made a vigorous attack upon Arnoldi, bishop of Treves, for having made a relic, which he alleged to be the holy seamless coat of Christ, an object of pilgrimage and adoration. On Ronge's excommunication on this account, by the chapter of Breslau in December, 1844, he received a large amount of public sympathy, and a dissenting congregation was almost immediately formed at Breslau with a very simple creed, in which the chief articles were belief in God and Father, creator and ruler of the universe; in Jesus Christ the Saviour, who delivers from the bondage of sin by his life, doctrine, and death; in the operation of the Holy Ghost; in a holy, universal Christian church; in forgiveness of sins and the life everlasting. Within a very few weeks similar communities had been formed at Leipzig, Dresden, Berlin, Offenbach, Worms, Wiesbaden, and elsewhere; and at a "council" convened at Leipzig in March, 1845, twenty-seven congregations were represented by delegates, of whom, however, only two or at most three were in clerical orders. Almost contemporaneously with the commencement of the agitation led by Ronge, another movement fundamentally distinct, though in some respects similar, had been originated at Schneidemühl, Posen, under the guidance of Johann Czerski, also a priest, who had come into collision with the church authorities on the then much discussed question of mixed marriages, and also on that

of the celibacy of the clergy. The result had been his suspension from office in March, 1844; his public withdrawal, along with twenty-four adherents, from the Roman communion in August; his excommunication immediately thereafter; and the formation, in October, of a "Catholic Apostolic Christian" congregation which, while rejecting various practices of the Roman Church, retained the Nicene theology and the doctrine of the seven sacraments. Czarski had been at some of the sittings of the "German Catholic" council of Leipsic; but when a formula somewhat similar to that of Breslau had been adopted, he refused to exhibit his signature because the divinity of Christ had been ignored, and he and his congregation continued to retain by preference the name of "Catholic Apostolic Christians," which they had originally assumed. Of the German Catholic congregations which had been represented at Leipsic some manifested a preference for the fuller and more positive creed of Schneidemühl, but a great majority continued to accept the comparatively negative theology of the Breslau school. The number of these increased with considerable rapidity, until in June, 1846, in Silesia alone the members of the German Catholic communion were reckoned by thousands, while the congregations scattered over Germany amounted in all to 173. In Austria, however, and ultimately also in Bavaria, the use of the name German Catholics was officially prohibited, that of "Dissidents" being substituted, while in Prussia the adherents of the new creed were laid under various disabilities; these and other circumstances, among which the frequent occurrence of internal dissensions was perhaps the gravest, conspired to check at an early stage the prosperous career of a movement which in its beginnings had been looked upon by many intelligent observers with considerable hopefulness. In 1859 some of the German Catholics entered into a union with the "Free Congregations," when the united body took the title of "The Religious Society of Free Congregations." Before that time many of the congregations which were formed in 1844 and the years immediately following had been dissolved, including that of Schneidemühl itself, which ceased to exist in 1857. No very recent statistics of a trustworthy kind as to the numerical strength of the German Catholics are accessible.

GERMANICUS, CÆSAR, a distinguished Roman general and provincial governor in the reign of Tiberius, was born 15 B.C., and died 19 A.D. His name Germanicus, the only one by which he is known in history, he inherited from his father Claudius Drusus Nero, the stepson of Augustus, and the most famous of his generals.

Of the early years and education of Germanicus little is known. In 12 A.D. he was made consul, though he had neither attained the legal age nor passed through the grades of prætor and ædile. Soon afterward he was appointed by Augustus to the important command of the eight legions on the Rhine. The news of the emperor's death found Germanicus at Lugdunum, where he was superintending the census of Gaul. Close upon this came the report that a mutiny had broken out among his legions on the lower Rhine. Germanicus hurried back to the camp, which was now in open insurrection. The tumult was with difficulty quelled, partly by well-timed concessions for which the authority of the emperor was forged, but mostly by the help of his personal popularity with the troops. Some of the insurgents actually proposed that he should put himself at their head and secure for himself the empire, but their offer was rejected with righteous horror. In order to calm the excitement and prevent further dissatisfaction, Germanicus determined at once on an active campaign.

Crossing the Rhine as the head of 12,000 legionaries and an equal number of allied troops, he attacked and routed the Marsi, and laid waste the valley of the Ems. In the following year he marched against Arminius, the conqueror of Varus, and reached the fatal battlefield in the Teutoburg Forest. The bones of the Roman soldiers still lay bleaching on the ground near the altars where their tribunes had been immolated, and the gibbets where the prisoners had been hanged. Having performed the last rites and erected a barrow to mark the spot, he led his army on, breathing vengeance against the foe. Arminius, however, favored by the marshy ground, was able to hold his own, and it required another campaign before he was finally defeated. A masterly combined movement by land and water enabled Germanicus to concentrate his forces against the main body of the Germans encamped on the Weser, and to crush them in two obstinately contested battles.

But no more victories were in store for Germanicus. His success had already stirred the jealousies and fears of Tiberius, and he was reluctantly compelled to obey the imperial summons and repair to Rome. The recent death of Archelaus, king of Cappadocia, and a disputed succession in Parthia and Armenia, afforded a sufficient plea for Roman interference; and, a few months after his return, Germanicus was dispatched to the East with extraordinary powers, and started on his mission without waiting to enter on his consulship. At the same time Tiberius took the further precaution of superseding Silanus, a connection of Germanicus, in the government of Syria, and appointing in his stead one of the most violent and ambitious of the old nobility, Cneius Calpurnius Piso, in order to watch his nephew's movements, and if necessary to check his ambition. Germanicus proceeded by easy stages to his province, halting on his way in Dalmatia, where he conferred with Drusus, his brother by adoption, and visiting the battlefield of Actium, Athens, Ilium, and other places of historic interest. At Rhodes he met for the first time his coadjutor Piso, who had followed in his wake, and was seeking everywhere to thwart his policy and asperse his character. When at last he reached his destination, he found little difficulty in effecting the settlement of the disturbed provinces, notwithstanding the violent and persistent opposition of Piso. At Artaxata Zeno, the popular candidate for the throne, was crowned king of Armenia; to the provinces of Cappadocia and Comagena Roman governors were assigned; and Parthia was conciliated by the banishment of the dethroned king Vonones. After wintering in Syria Germanicus started next year for a tour in Egypt. The chief motive for his journey was love of travel and antiquarian study, and it seems never to have occurred to him, till he was warned by Tiberius, that he was thereby transgressing an unwritten law of the empire forbidding any Roman of rank to set foot in Egypt without express permission. On his return to Syria he found that all his arrangements had been upset by Piso. Violent recriminations followed, the result of which, it would seem, was a promise on the part of Piso to quit the province. But at this juncture Germanicus fell ill. Piso deferred his departure, and, when at length compelled to start, lingered in the neighborhood of Syria, receiving with open exultation the bulletins which told of the prince's rapid decline. Germanicus on his side was fully convinced that he had fallen a victim to the arts of his unscrupulous enemy. He knew that he was dying, and believed that he was dying of poison. Even his gentle nature was stung to madness at the thought, and with his dying words he called to his friends and family to denounce his murderer and avenge his death. Whether these suspicions were true must remain an

open question, yet the arguments in favor of a death from natural causes seem to preponderate.

GERMAN SILVER, or NICKEL SILVER, known also under the name of white copper and packfong, is an alloy of copper, nickel, and zinc, prepared either by melting the copper and nickel together in a crucible, and adding piece by piece the previously heated zinc, or by heating the finely divided metals under a layer of charcoal, by means of an air furnace of strong draught, and promoting the thorough solution of the nickel by stirring. To destroy its crystalline structure, and so render it fit for working, it is heated to dull redness, and then allowed to cool. German silver is harder than silver; it resembles that metal in color, but is of a grayer tinge. Exposed to the air it tarnishes slightly yellow, and with vinegar affords a crust of verdigris. At a bright red heat it melts, and with access of the atmosphere loses its zinc by oxidation. At a heat above dull redness it becomes exceedingly brittle. German silver is much used in the arts. For the manufacture of imitation silver for knives and forks its composition is — nickel and zinc of each two parts, and copper four parts; for handles of spoons and forks the proportion of copper in this formula is increased by one. For rolling, the most suitable alloy is copper three parts, zinc one, nickel one. Candlesticks, bells, spurs, and other cast articles are made of a German silver containing 2 or 3 percent. of lead. The addition of 2 to 2½ per cent. of iron, which must first be melted with part of the copper, makes an alloy which is whiter, but also more brittle and harder, than ordinary German silver.

GERMANY. *Geography and Statistics.* — The German empire occupies the greater portion of central Europe, and has but few lines of natural boundary. If, by the designation Germany, is meant the territory inhabited by Germans, this is considerably larger than the German empire constituted in 1871, the former having an area of about 340,000 and the latter of 208,830 English square miles. The eastern provinces project so far that the extent of the German territory is much greater from southwest to northeast than in any other direction. Tilsit is 815 miles from Metz, whereas Hadersleben, in Schleswig, is only 540 miles from the lake of Constance. The difference in time between the eastern and western points is one hour and eight minutes. The empire is bounded on the southwest and south by Austria and Switzerland (for 1,170 miles), on the southwest by France (275 miles), on the west by Luxembourg, Belgium, and Holland (together 512 miles). The length of German coast on the North Sea or German Ocean, is 300 miles, and on the Baltic 830 miles, the intervening land boundary on the north of Schleswig being only fifty-three miles. The eastern boundary is Russia (725 miles).

The total area of the empire, including rivers and lakes, but not the "haffs" or lagoons on the Baltic, is 208,830 English square miles, which is about the eighteenth part of Europe, the 250th part of the whole dry land, and the 853d part of the whole surface of the globe.

Physical Features. — The length of the coast-line is scarcely the third part of the whole frontier, so that the Germans must be regarded as less a maritime than an inland people. Unlike the eastern states of Europe, the German empire has not only an inland sea-shore, but is also in direct communication with the great oceans by means of the North Sea. The coasts of Germany are shallow, and deficient in natural ports, except on the east of Schleswig-Holstein, where wide bays encroach upon the land, giving access to the largest vessels, so that a great harbor for men-of-war

has been constructed at Kiel. With the exception of those on the east coast of Schleswig-Holstein, all the important trading ports of Germany are river ports, such as Emden, Bremen, Hamburg, Lübeck, Stettin, Dantzic, Königsberg, Memel. A great difference, however, is to be remarked between the coasts of the North Sea and those of the Baltic. On the former, where the sea has broken up the ranges of dunes formed in bygone times, and divided them into separate islands, the mainland has to be protected by massive dikes, while the Frisian Islands are being gradually washed away by the waters. On the coast of East Friesland there are now only seven of these islands, of which Nordene, a bathing-place, is best known, while of the North Frisian Islands, on the western coast of Schleswig, Sylt is the most considerable. Besides the ordinary waste of the shores, there have been extensive inundations by the sea within the historic period, the gulf of the Dollart having been so caused in the year 1276. Sands surround the whole coast of the North Sea to such an extent that the entrance to the ports is not practicable without the aid of pilots. Heligoland, which was ceded by England in 1890, is a rocky island, but it also has been considerably reduced by the sea. The tides rise to the height of twelve or thirteen feet in the Jahde Bay and at Bremerhafen, and six or seven feet at Hamburg. The coast of the Baltic on the other hand possesses few islands, the chief being Alsen and Fehmarn off the coast of Schleswig-Holstein, and Rügen off Pomerania. It has no extensive sands, though on the whole very flat. The Baltic has no perceptible tides; and a great part of its coast-line is in winter covered with ice, which also so blocks up the harbors that navigation is interrupted for several months every year. Its three haffs fronting the mouths of the large rivers must be regarded as lagoons or extensions of the river beds, not as bays. The Oder Haff is separated from the sea by two islands, so that the river flows out by three mouths, the middle one (Swine) being the most considerable. The Frische Haff is formed by the Nogat, a branch of the Vistula, and by the Pregel, and communicates with the sea by means of the Pillau Tief. The Kurische Haff receives the Memel, called Niemen in Russia, and has its outlet in the extreme north at Memel. Long, narrow alluvial strips, called *Nehrungen*, lie between the last two haffs and the Baltic. The Baltic coast is further marked by large indentations, the Gulf of Lübeck, that of Pomerania, east of Rügen, and the semicircular Bay of Dantzic, between the promontories of Rixhöft and Brästerort. The German coasts are now well provided with lighthouses.

In respect of physical structure Germany is divided into two entirely distinct portions, which bear to one another a ratio of about three to four. The northern and larger part may be described as a uniform plain, covered generally by very recent deposits, but with small areas of Tertiary and Secondary formations protruding here and there. South and Central Germany, on the other hand, is very much diversified in scenery and in geological structure. It possesses large plateaus, such as that of Bavaria, which stretches away from the foot of the Alps, fertile low plains like that intersected by the Rhine, mountain chains, and isolated groups of mountains, comparatively low in height, and so situated as not seriously to interfere with communication either by road or by railway. Its geological structure corresponds to this diversity of surface. The most ancient rocks of Germany are the gneisses, schists, and granites which form the Bohemian and Bavarian plateau, and extend into Saxony. Another isolated mass of similar rocks rising into the heights of the Vosges and Black





Forest has been cut through by the valley of the Rhine. Silurian rocks are but scantily developed in Germany. The Devonian system, however, occupies an extensive area, since it forms the high tableland of the Taunus, Hunsrück, and Eifel, which ranges westward into Belgium. Carboniferous rocks with productive coal-fields cover isolated areas, chiefly in north-western Germany, particularly in Westphalia, at Saarbrück, in Saxony, and in Upper and Lower Silesia (see COAL). Between the Devonian uplands of the Taunus and the crystalline rocks of Bavaria a vast area of western Germany is occupied by the Triassic system, which ranges from Hanover to Basel and from near Metz to Baireuth. The southern half of this vast Triassic basin is bordered by a belt of overlying Jurassic rocks which skirt the Danubian plain in Württemberg and Bavaria. Cretaceous rocks occur chiefly in north Germany in scattered patches flanking older formations. They evidently underlie the great plain, since they are found rising up here and there to the surface between Westphalia and Denmark. Miocene deposits extend into numerous detached basins, including those of the Rhine below Bonn, and at Mainz, the country round Magdeburg, and the plains of Bavaria. These strata contain valuable seams of lignite. The vast plains of northern Germany are covered with glacial drift, which rises to heights of 1,400 feet above the sea along the edges of the flanking hills. Igneous rocks of different ages have been erupted in many districts, and further diversify the geology. The best known are the Tertiary and post-Tertiary lavas and cones of the Eifel and Siebengebirge; others of more ancient date occur along the southern slopes of the Harz.

Bavaria is the only division of the country that includes within it any part of the Alps, the Austro-Bavarian frontier running along the ridge of the Northern Tyrolean or Bavarian Alps. The Upper German plain sloping northward from the Bavarian Alps is watered by the Lech, the Isar, and the Inn, tributaries of the Danube, all three rising beyond the limits of German territory. This plain is separated on the west from the Swiss plain by the Lake of Constance (Bodensee, 1,306 feet above sea-level), and on the east from the undulating grounds of Austria by the Inn. The average height of the plain may be estimated at about 1,800 feet, the valley of the Danube on its north border being from 1,540 feet (at Ulm) to 920 feet (at Passau). The plain is not very fertile. In the upper part of the plain, toward the Alps, there are several lakes, the largest being the Ammersee, the Würmsee or Starnberg Lake, and the Chiemsee. Many portions of the plain are covered by moors and swamps of large extent; there called *Moore*. The left or northern bank of the Danube, from Regensburg (Ratisbon) downward presents a series of granitic rocks called the Bavarian Forest, which must be regarded as a branch of the Bohemian Forest. The latter is a range of wooded heights on the frontier of Bavaria and Bohemia, occupying the least known and least frequented regions of Germany. The valley of the Danube above Ratisbon is flanked by Jurassic plateaus sloping gently to the Danube, but precipitous toward the valley of the Neckar. The center of this elevated tract is the Rauhe Alp, so named on account of the harshness of the climate. The plateau continuing to the northeast and then to the north, under the name of the Franconian Jura, is crossed by the valley of the winding Altmühl, and extends to the Main. To the west extensive undulating grounds or low plateaus occupy the area between the Main and the Neckar.

The southwestern corner of the empire contains a series of better defined hill-ranges. Beginning with the Schwarzwald (Black Forest), we find its southern heights decline to the valley of the Rhine, above Basel,

and to the Jura. Northward the Black Forest passes into the plateau of the Neckarbergland. The heights between the lower Neckar and the Main form the Odenwald; and the Spessart, which is watered by the Main on three sides, is nothing but a continuation of the Odenwald. West of this range of hills lies the valley of the upper Rhine, extending about one hundred and eighty miles from south to north, and with a width of only twenty to twenty-five miles. In the upper parts the Rhine is rapid, and therefore navigable with difficulty; this explains why the towns there are not along the banks of the river, but some five to ten miles off. But from Speyer (Spires) town succeeds town as far down as Düsseldorf. The western boundary of this valley is formed in the first instance by the Vosges, where granite summits rise from under the surrounding red Triassic rocks. To the south the range is not continuous with the Swiss Jura, the valley of the Rhine being connected here with the Rhone system by low ground known as the Gate of Mülhausen. The crest of the Vosges is pretty high and unbroken, the first convenient pass being near Zabern, which has been taken advantage of for the railway from Strasburg to Paris. On the northern side the Vosges are connected with the Haardt sandstone plateau, which rises abruptly from the plain of the Rhine. The mountains south of Mainz (Mayence), which are mostly covered by vineyards, are lower, the Donnersberg, however, raising its head to 2,262 feet. These hills are bordered on the west by the high plain of Lorraine and the coal-fields of Saarbrücken, the former being traversed by the river Moselle. The larger half of Lorraine belongs to France, but the German part possesses great mineral wealth in its rich layers of ironstone (siderite), and in the coal-fields of the Saar. The Devonian tract of the Hunsrück, Taunus and Eifel is an extended plateau, divided into separate sections by the river valleys. Among these the Rhine valley from Bingen to Bonn, and that of the Moselle from Treves to Coblenz, are winding gorges excavated by the rivers. The Eifel presents a sterile, thinly-peopled plateau, covered by extensive moors in several places. It passes westward imperceptibly into the Ardennes. The hills on the right bank of the Rhine also are in part of a like barren character, without wood; the Westerwald, which separates the valleys of the Sieg and Lahn, is particularly so. The northern and southern limits of the Niederrheinisches Gebirge present a striking contrast to the central region. In the south the declivities of the Taunus are marked by the occurrence of mineral springs, as at Ems on the Lahn, Nauheim, Homburg, Soden, Wiesbaden, etc., and by the vineyards which produce the best Rhine wines. To the north of this Gebirge, on the other hand, lies the great coal basin of Westphalia (the largest in Germany). In the south of the hilly duchy of Hesse rise the isolated mountain groups of the Vogelsberg and the Rhön, separated by the valley of the Fulda, which uniting further north with the Werra forms the Weser. To the east of Hesse lies Thuringia, a province consisting of the far-stretching wooded ridge of the Thüringer Wald, and an extensive elevated plain to the north. Its rivers are the Saale and Unstrut. This plateau is bounded on the north by the Harz, an isolated group of mountains, rich in minerals, with its highest elevation in the bare summit of the Brocken. To the west of the Harz a series of hilly tracts is comprised under the name of the Weser Mountains, out of which above Minden the river Weser bursts by the Porta Westphalica. A narrow ridge, the Teutoburger Wald, extends between the Weser and the Ems as far as the neighborhood of Osnabrück.

To the east the Thüringer Wald is connected by the plateau of the Frankenwald with the Fichtelgebirge. This group of mountains, occupying what might be regarded as ethnologically the center of Germany, forms a hydrographical center, whence the Nab flows southward to the Danube, the Main westward to the Rhine, the Eger eastward to the Elbe, and the Saale northward, also into the Elbe. In the northeast the Fichtelgebirge connects itself directly with the Erzgebirge, which forms the northern boundary of Bohemia. The southern sides of this range are comparatively steep; on the north it slopes gently down to the plains of Leipsic, but is intersected by the deep valleys of the Elster and Mulde. Although by no means fertile, the Erzgebirge is very thickly peopled, as various branches of industry have taken root there in numerous small places. Around Zwickau there is a productive coal-field, and mining for metals is carried on near Freiberg. In the east a tableland of sandstone, called Saxon Switzerland, from the picturesque outlines into which it has been eroded, adjoins the Erzgebirge; one of its most notable features is the deep ravine by which the Elbe escapes from it. Numerous quarries, which supply the North German cities with stone for buildings and monuments, have been opened along the valley. The sandstone range of the Elbe unites in the east with the low Lusatian group, along the east of which runs the best road from northern Germany to Bohemia. Then comes a range of lesser hills, clustering together to form the frontier between Silesia and Bohemia. The most western group is the Isergebirge, and the next the Riesengebirge, a narrow ridge of about twenty miles' length, with bare summits. Excluding the Alps, the Schneekoppe (5,266 feet) is the highest peak in Germany; and the southern declivities of this range contain the sources of the Elbe. The hills north and northeast of it are termed the Silesian Mountains. Here one of the minor coal-fields gives employment to a population grouped round a number of comparatively small centers. One of the main roads into Bohemia (the pass of Landshut) runs along the eastern base of the Reisengebirge. Still farther to the east the mountains are grouped around the hollow of Glatz, whence the Neisse forces its way toward the north. This hollow is shut in on the east by the Sudetic group, in which the Altvater rises to almost 4,900 feet. The eastern portion of the group, called the Gesenke, slopes gently away to the valley of the Oder, which affords an open route for the international traffic, like that through the Mülhausen Gate in Alsace. Geographers style this the Moravian Gate.

The North-German plain presents little variety, yet is not absolutely uniform. A row of low hills runs generally parallel to the mountain ranges already noticed, at a distance of twenty to thirty miles to the north. Westward lies, as the last link of this series, the Lüneburger Heide or Heath, between the Weser and Elbe, north of Hanover. A second tract, of moderate elevation, sweeps round the Baltic, without, however, approaching its shores. This plateau contains a considerable number of lakes, and is divided into three portions by the Vistula and the Oder. The finely wooded heights which surround the bays of the east coast of Holstein and Schleswig may be regarded as a continuation of the Baltic elevations. The lowest parts, therefore, of the North-German plain, excluding the sea-coasts, are the central districts from about 52° to 53° N. latitude, where the Vistula, Netze, Warthe, Oder, Spree, and Havel form vast swampy lowlands, which, during the last hundred years, have been considerably reduced by the construction of canals and by cultivation—improvements due in large measure to Frederick the Great. The Spreewald, to the southeast

of Berlin, is one of the most remarkable districts of Germany. As the Spree divides itself there into innumerable branches, inclosing thickly wooded islands, boats form the only means of communication. West of Berlin the Havel widens into what are called the Havel lakes, to which the environs of Potsdam owe their charms. In general the soil of the North-German plain cannot be termed fertile, the cultivation nearly everywhere requiring severe and constant labor. Long stretches of ground are covered by moors, and there turf-cutting forms the principal occupation of the inhabitants. The greatest extent of moorland is found in the westernmost parts of the plain, in Oldenburg and East Frisia. The plain contains, however, a few districts of the utmost fertility, particularly the tracts on the central Elbe, and the marsh lands on the west coast of Holstein and the north coast of Hanover, Oldenburg, and East Frisia, which, within the last two centuries, the inhabitants have reclaimed from the sea by means of immense dikes.

Nine independent river-systems may be distinguished; those of the Memel, Pregel, Vistula (Weichsel), Oder, Elbe, Weser, Ems, Rhine, and Danube. Of these the Pregel, Weser, and Ems belong entirely, and the Oder mostly, to the German empire. The Danube has its sources in German soil; but only the fifth part of its course is German. Its total length is 1,730 miles, and the Bavarian frontier at Passau, where the Inn joins it, is only 350 miles distant from its sources. It is navigable as far as Ulm, 220 miles above Passau; and its tributaries the Lech, Isar, Inn, and Altmühl are also navigable. The Rhine is the most important river in Germany, although neither its sources nor its mouths are within the limits of the empire. From the Lake of Constance to Basel (122 miles) the Rhine forms the boundary between the German empire and Switzerland; the canton of Schaffhausen, however, is situated on the northern bank of the river. From Basel to below Emmerich the Rhine belongs to the German empire—about 470 miles, or fourth-sevenths of its whole course. It is navigable all this distance, as are also the Neckar from Esslingen, the Main from Bamberg, the Lahn, the Lippe, the Ruhr, the Moselle from Metz, with its affluents the Saar and Sauer. Vessels sail up the Ems as far as Papenburg, and river craft as far as Greven, and the river is connected with a widely branching system of canals for turboats. The Fulda, navigable for sixty-three miles, and the Werra thirty-eight miles, above the point where they unite, form by their junction the Weser, which has a course of 271 miles, and receives as navigable tributaries the Aller, the Leine from Hanover, and some smaller streams. Large steamers cannot, however, get as far as Bremen, and that commercial emporium has in consequence been obliged to form a seaport at Bremenhafen. The Elbe, after a course of 250 miles, enters German territory near Aussig, 482 miles from its mouth. It is navigable above this point to its junction with the Moldau. Hamburg may be reached by vessels of ten to eleven feet draught. The navigable tributaries of the Elbe are the Saale (below Naumburg), the Havel, Spree, Elde, Sude, and some others. The Oder begins to be navigable almost on the frontier at Ratibor, 480 miles from its mouth, receiving as navigable tributaries the Glatz Neisse and the Warthe. Only the lower course of the Vistula belongs to the German empire, within which it is a broad, navigable stream of considerable volume. On the Pregel ships of 2,500 tons reach Königsberg, and river barges reach Insterburg; the Alle, its tributary, may also be navigated. The Memel is navigable in its course of 113 miles from the Russian frontier. Germany is thus a country abounding in natural waterways,

the total length of them being estimated at 7,000 miles. But it is only the Rhine, in its middle course, that has at all times sufficient volume of water to meet the requirements of a good navigable river.

The regions which abound in lakes have already been pointed out. The Bodensee or Lake of Constance (186 square miles) is on the frontier of the empire—portions of the northern banks belonging severally to Bavaria, Württemberg, and Baden. The largest lake entirely on German territory is the Chiemsee (seventy-five square miles); the Ammersee and the Würmsee are, however, but little less. A good many smaller lakes are to be found in the Bavarian Alps. The North-German plain is dotted with upward of 500 lakes, covering an area of about 2,500 square miles. The largest of these are the three Haffs—the Oderhaff covering 370 square miles, the Frische Haff 332, and the Kurische Haff 626. The lakes in the Prussian and Pomeranian provinces, in Mecklenburg, and in Holstein, and those of the Havel, have already been mentioned. In the west the only lakes of importance are the Steinhuder Meer, fourteen miles northwest of Hanover, and the Dümmersee on the southern frontier of Oldenburg.

The climate of Germany is to be regarded as intermediate between the oceanic and continental climates of western and eastern Europe respectively. It has nothing in common with the Mediterranean climate of southern Europe, Germany being separated from that region by the lofty barrier of the Alps. Although there are very considerable differences in the range of temperature and the amount of rainfall throughout Germany, these are not so great as they would be were it not that the elevated plateaus and mountain chains are in the south, while the north is occupied by low-lying plains.

The flora of Germany comprises about 3000 species of phanerogamic and about 4000 cryptogamic plants. The country does not, however, form a single natural region, and cannot be characterized distinctively by any of the principal botanical types.

The woodlands form about one-fourth of the entire soil, the proportion of forest being far greater than in any other state in the west or south of Europe; the percentage for France is but seventeen, for Italy twelve, for Great Britain about three. The state forests alone occupy 17,600 square miles; and the greatest attention is paid throughout the empire to forest culture. Speaking generally, northern is not nearly so well wooded as central and southern Germany, where indeed most of the smaller mountains are covered with timber, as is indicated by the frequent use of the termination of *wald* affixed to the names of the mountain ranges (as Schwarzwald, Thüringer Wald, etc.) A narrow strip along the shores of the Baltic is covered with oaks and beeches; further inland coniferous trees are the most prevalent, particularly the Scotch fir; birches are also abundant. The mountain forests consist chiefly of firs, pines and larches, but contain also silver firs, beeches, and oaks. Chestnuts appear on the terraces of the Rhine valley, and in Swabia and Franconia. The whole northwest of Germany is destitute of wood, but to compensate for this the people have ample supplies of fuel in the extensive stretches of turf.

The same kinds of cereal crops are cultivated in all parts of the empire, but in the south and west wheat is predominant, and in the north and east rye, oats, and barley. To these in some districts are added spelt, buckwheat, millet, rice-wheat, lesser spelt, and maize. In general the soil is remarkably well cultivated. The three years' rotation formerly in use, where autumn and spring-sown grain and fallow succeeded each other, has now been abandoned, except in some districts, where the system has been modified and improved. In South

Germany the so-called *Fruchtwechsel* is practiced, the fields being sown with grain crops every second year, and with peas or beans, grasses, potatoes, turnips, etc., in the intermediate years. In North Germany the mixed *Koppelwirtschaft* is extending, by which system, after several years of grain crops, the ground is for two or three seasons in pasture. No general statistics on the subject of crops have as yet been published, but, according to private estimate, a fair average season will yield 325 million quarters of rye, oats 300, wheat and spelt 170, barley 100. In good seasons the production has been found sufficient to meet the native demand. Formerly the exports of the produce of the wheat and pulse crops exceeded the imports, but the importation of cereals has now for a number of years been constantly increasing. The potato is largely cultivated, not merely for food, but for distillation into spirits. This manufacture is prosecuted especially in eastern Germany. The Prussian provinces east of the Elbe, including Mecklenburg and Saxony, with a population of about nineteen millions, produced seventy-two million gallons of spirits in 1876, while the rest of Germany (population twenty-four millions) produced only twenty-five million gallons. The common beet is largely grown in some districts for the production of sugar, which has greatly increased during the last thirty years. There are two centers of the beet-root sugar production; 231 factories, or more than two-thirds of the whole, are in Prussian Saxony, Hanover, Brunswick, Anhalt, and Thuringia, and there are seventy-one in Silesia, Brandenburg, and Pomerania, the principal center of the latter group being Frankfort-on-the-Oder. Flax and hemp are cultivated, though not so much as formerly, for manufacture into linen and canvas, and also for the production of oil. The home supply no longer suffices for the native demand. The cultivation of hops is in a very thriving condition in the southern states of Germany. The soil occupied by hops was estimated in 1873 at 93,680 acres,—a larger area than in any other country of the globe (Great Britain having about 70,000 acres). The total production of hops is 477,000 cwt., and of this 402,000 cwt. are grown in Bavaria, Württemberg, Baden, and Alsace-Lorraine. Hops thus form one of the standard articles of exportation from Germany, as well as beer. The following table shows the number of breweries in different parts of the country, and the amount of their production:

STATES.	Breweries.	Total.	Per Head.
		Gallons.	Gallons.
Northern Germany.....	12,186	448,000,000	14
Bavaria, not including }	6,703	269,000,000	59
Palatinate..... }			
Palatinate (estimated).....		13,000,000	20
Württemberg.....	7,777	85,300,000	46
Baden (estimated).....	1,500	24,200,000	18
Alsace-Lorraine.....	241	17,600,000	11
Total, about.....	28,500	857,100,000	20

Tobacco forms the most productive and most profitable object of culture in many districts. The total extent under this crop in 1876 was 53,720 acres, no less than 32 per cent. of this being in Baden, 22 in Bavaria, 16 in Alsace-Lorraine, and only 30 per cent. in the rest of Germany. In the north, the plant is cultivated principally in Pomerania, Brandenburg, and East and West Prussia. Of late years the production has on the whole diminished, the average amount having been 800,000 cwt. from 1872 to 1876.

The culture of the vine is almost confined to Southern and Western Germany, and especially to the Rhine dis-

trict. In the valley of the Saale and Elbe (near Dresden), and in Lower Silesia (between Guben and Grünberg), the number of vineyards is small, and the wines of inferior quality; but along the Rhine from Basel to Coblenz, in Alsace, Baden, the Palatinate, and Hesse, and above all in the province of Nassau, the lower slopes of the hills are literally covered with vines. Here are produced the celebrated Rüdesheimer, Hochheimer, and Johannisberger. The vines of the lower Main, particularly those of Würzburg, are the best kinds; those of the upper Main and the valley of the Neckar are rather inferior. The Moselle wines are lighter and more acid than those of the Rhine. The total amount produced in Germany is estimated at 1000 million gallons,—Alsace-Lorraine turning out 400 millions, Baden 175, Bavaria, Württemberg and Hesse together, 300, while the remainder, which, though small in quantity, is in quality the best, is produced by Prussia.

Live Stock.—The cultivation of grazing lands in Germany has been greatly improved in recent times, and is in a highly prosperous condition. The provinces of Pomerania and Hanover are particularly remarkable in this respect. The best meadow lands of Bavaria are in the outer range of the Alps, those of Saxony in the Erzgebirge.

The breeding of domestic animals is prosecuted most extensively in Bavaria, and in the maritime provinces. There we find 1,000 to 1,500 head of the larger kinds (horses, cattle, sheep, goats, swine) for every 1,000 inhabitants; in the rest of Eastern Germany 600 to 800; and in Central and Southern Germany only 400 to 600; In the number of horses Germany ranks with Great Britain (about eighty for every 1,000 inhabitants); and, although the production cannot satisfy the home demand, the imports being nearly 30,000 in excess of the exports annually, the breeding of horses has attained great perfection. The main center is in East and West Prussia, where there are more than half a million of horses—about thirty per English square mile; then follow the marsh districts on the Elbe and Weser, some parts of Westphalia, Saxony, and Upper Silesia, Lower Bavaria, Lower Alsace, and Lorraine. Cattle abound in most South-German states, especially Bavaria and Württemberg, where there are 180 to 200 head for every square mile. In the northern and northeastern districts, on the other hand, the numbers are small (in some districts only thirty to fifty head to the square mile), except Schleswig-Holstein and the marsh lands along the shores of the North Sea, whence there is a considerable exportation to England. The aggregate number of sheep in Germany is only exceeded in Europe by that in Great Britain and Russia. The principal sheep districts are Pomerania and Mecklenburg (300 per square mile). As a rule, sheep-farming is resorted to where the soil is of inferior quality and unsuitable for tillage and the breeding of cattle. Far more attention is accordingly given to the rearing of sheep in Northern and Northeastern Germany than in Schleswig-Holstein, East Frisia, Westphalia, Rhineland, and South Germany. At the same time the native demand for wool is not covered by the home production. The largest stock of swine is in Central Germany and Saxony, in Westphalia, on the lower Rhine, in Lorraine, Hesse, etc. Central Germany (especially Gotha and Brunswick) exports sausages and hams largely, as well as Westphalia; but the excess of swine imported over the exports for the whole of Germany ranges from 600,000 to 800,000 annually.

The number of wild animals in Germany is not very great. Foxes, martens, weasels, badgers, and others are to be found everywhere; wolves are rare, but they find their way sometimes from French territory to the western provinces, or from Poland to Prussia and

Posen. Among the rodents the *hamster* and the field mouse are a scourge to agriculture. Of game there are the roe, stag, boar, and hare; the fallow deer and the wild rabbit are less common. The elk is to be found in the forests of East Prussia. The feathered tribes are everywhere abundant in the fields, woods, and marshes. Wild geese and ducks, grouse, partridges, snipes, woodcocks, quails, widgeons, and teal are plentiful all over the country. Geese and ducks are found mostly in the flat districts, where the great abundance of standing water affords ample scope for their increase. Tame geese are bred in large flocks, particularly in Pomerania.

The waters of Germany abound with fish; but the genera and species are few. Carp and salmon tribes are the most abundant; after them rank the pike, the eel, the shad, the roach, the perch, and the lamprey. In addition to frogs, Germany has few varieties of Amphibia. Of serpents there are only two kinds, one of them being poisonous.

The rearing of bees is particularly attended to in the healthy districts of Hanover. The number of bee-hives may be estimated at 2,000,000, and the produce of wax and honey at 100,000 cwts. The cultivation of silk-worms has been attempted, but has either entirely failed or had very indifferent success. In 1852-62 an attempt was made to extend the cultivation of the mulberry in the province of Brandenburg; but disease among the silk-worms, which it was found impossible to repress, rendered it unsuccessful.

Minerals.—Germany abounds in useful minerals, and in consequence takes a high place among industrial states. The production falls short, indeed, of that of England, but bears comparison with that of France and of the United States.

There are six large coal fields, occupying an area of about 3,600 square miles, of which the most important occupies the basin of the Ruhr, its extent being estimated at 2,800 square miles. Here there are more than sixty beds, of a total thickness of 150 to 200 feet of coal; and the amount in the pits has been estimated at 45,000 millions of tons, so that the basin, at the present rate of 109,500,000 tons raised per annum, would not be exhausted in 1,000 years. Smaller fields are found near Osnabrück, Ibbenbüren and Minden, and a larger one near Aix-la-Chapelle. The Saar coal-fields, within the area inclosed by the rivers Saar, Nahe and Blies (460 square miles), is one of great importance. The thickness of eighty beds amounts to 250 feet, and Von Dechen estimates the total mass of coal at 45,400,000,000 tons. The greater part of the basin belongs to Prussia, the rest to Lorraine. A still larger field exists in the Upper Silesian basin, on the borderland between Austria and Poland, containing about 50,000,000,000 tons. Beuthen is the chief center. The Silesian coal-fields have a second center in Waldenburg, east of the Riesengebirge. The Saxon coal-fields stretch eastward for some miles from Zwickau. Deposits of less consequence are found in Upper Bavaria, Upper Franconia, Baden, in the Hartz, etc.

Germany abounds in iron ores, some of which are of superior quality. The production increased rapidly for a time, but in recent years there has been a very great decline.

Germany possesses abundant salt deposits. The actual production not only covers the home consumption, but also allows a yearly increasing exportation, especially to Russia, Austria and Scandinavia.

Shipping.—The German merchant marine has always been distinguished by the excellence of its personnel. The seamen of Frisia are acknowledged to be among the best in the world, and the shipping of Bremen and Hamburg had won an everywhere re-

spected name long before a German merchant marine, properly so called, was heard of. In 1901 the mercantile navy comprised 1,390 steamers, of 1,347,875 tons, and 2,493 sailing vessels, of 593,770 tons, making a total of 3,883 vessels, of 1,941,645 tons. Of these 2,518 vessels, of 412,417 tons, belonged to Prussian ports. The total number of sailors employed in the merchant service in 1901 was 50,556. The movement of shipping at all German ports in 1886 was as follows:

Vessels.	With Cargoes.	Tonnage	In Bal- last.	Tonnage.	Total No.	Total Tonnage.
Entered	49,819	9,423,304	9,485	869,109	59,304	10,292,413
Cleared	44,791	7,683,540	14,445	2,655,881	59,236	10,339,421

Of the total tonnage entered and cleared, 10,263,013 tons were under the German, and 5,751,954 tons under the British flag.

Telegraph and Postal Service.—By combining the postal and telegraphic departments Germany has been saved a large number of officials; but great sums are still expended annually on the extension of the telegraph system. At the end of 1886 the length of telegraph lines in the empire was 53,874 miles, having 191,272 miles of wire. The number of messages during the year was 20,510,294, of which 14,568,346 were internal. With the exception of Bavaria and Württemberg, which have administrations of their own, all the German states belong to the system of the reichspost. Germany, including the above named two kingdoms, constitutes with Austria-Hungary a special postal union, besides forming part of the international postal union. The receipts of the postoffice during 1900-01 amounted to 447,041,824 marks, and the expenditure to 429,154,073 marks. There were 37,242 postoffices, employing 221,306 persons at the end of 1900. During the year there were transmitted 1,847,043,960 letters, 1,020,339,360 post-cards, 20,187,170 patterns, 245,618,370 stamped wrappers, 578,611,143 journals, and 180,492,148 registered packets and money-orders of the total declared value of 29,376,486,976 marks.

The German empire is a union of twenty-five sovereign states—four kingdoms, six grand-duchies, five duchies, seven principalities, three free towns. Alsace-Lorraine, ceded by France at the peace concluded May 10, 1871, forms a twenty-sixth constituent of the confederation, but it is administered by the central authority. The supreme direction of the military and political affairs of the empire has, by the vote of the reichstag or diet of the North German confederation, been vested in the king of Prussia, who accordingly bears the title of German Emperor.

The imperial dignity is hereditary in the line of Hohenzollern, and follows the law of primogeniture. The emperor exercises the imperial power in the name of the confederated states. In his office he is assisted by a federal council or bundesrath, which represents the governments of the individual states of Germany. The members of this council, fifty-nine in number, are appointed for each session by the governments of the individual states. The legislative functions of the empire are vested in the emperor, the bundesrath, and the reichstag or diet. The members of the latter, 397 in number, are elected for a space of three years by universal suffrage. Vote is by ballot, and one member is elected by (approximately) every 100,000 inhabitants.

As regards its legislative functions, the empire has supreme and independent control in matters relating to military affairs and the navy, to the imperial finances, to German commerce, to posts and telegraphs, and also to railways, in so far as these affect the common defense

of the country. Bavaria and Württemberg, however, have preserved their own postal and telegraphic administration. The legislative power of the empire also takes precedence of that of the separate states in the regulation of matters affecting freedom of migration, domicile, settlement, and the rights of German subjects generally, as well as in all that relates to banking, patents, protection of copyright claims, navigation of rivers and canals, civil and criminal legislation, judicial procedure, sanitary police, and control of the press and of associations.

The executive power is in the emperor's hands. He represents the empire internationally, and can declare war if defensive, and make peace as well as enter into treaties with other nations; he also appoints and receives ambassadors. For declaring offensive war the consent of the federal council must be obtained. The separate states have the privilege of sending ambassadors to the other courts; but all consuls abroad are officials of the empire, and are named by the emperor.

Both the federal council and the reichstag meet in annual sessions convoked by the emperor, who has the right of proroguing and dissolving the diet; but the prorogation must not exceed sixty days, and in case of dissolution new elections must be ordered within sixty days, and the new session open within ninety days. All laws for the regulation of the empire must, in order to pass, receive the votes of an absolute majority of the federal council and the reichstag.

The federal council is presided over by the chancellor of the empire (Reichskanzler). Imperial measures, after passing the federal council and the reichstag, must obtain the sanction of the emperor in order to become law, and must be countersigned, when promulgated, by the chancellor of the empire. All members of the federal council are entitled to be present at the deliberations of the reichstag. The federal council, acting under the direction of the chancellor of the empire, is also a supreme administrative and consultative board, and as such it has nine standing committees, viz.—for army and fortresses; for naval purposes; for tariffs, excise and taxes; for trade and commerce; for railways, posts and telegraphs; for civil and criminal law; for financial accounts; for foreign affairs; and for Alsace-Lorraine. Each committee includes representatives of at least four states of the empire.

For the several branches of administration a considerable number of imperial offices have been gradually created. All of them, however, either are under the immediate authority of the chancellor of the empire, or are separately managed under his responsibility. The most important are the chancery office, the foreign office, and the general post and telegraph office. But the heads of these do not form a cabinet.

By the electoral law of May 31, 1869, every German of twenty-one years of age is entitled to be an elector, and every one who has completed his twenty-fifth year, and has resided for a year in one of the federal states, is eligible for election. The deputies are unsalaried, but during the session they have the right of traveling free by rail.

All the German states are constitutional, except Alsace-Lorraine and the two grand-duchies of Mecklenburg. The six larger states have adopted the two-chamber system, but in the composition of the houses great differences are found. As regards the lower house, 60,000 inhabitants elect one deputy in Prussia, 33,000 in Bavaria, 35,000 in Saxony, 20,000 in Württemberg, 24,000 in Baden, 18,000 in Hesse.

Railroads.—The period of railroad construction was inaugurated in Germany by the opening of the line from Nuremberg to Fürth in 1835, but the development of

the system was slow. Until 1866 there was no railroad from Bremen in the interior of Germany, while now there are four. Prior to 1865 the construction of railroads advanced pretty uniformly. Germany was at that time far outstripped in the extent of its railroad system by England, Belgium and Switzerland, and even by France. A new period of railroad construction began with the year 1866, and is closely connected with the economical and political progress of Germany. Numerous great undertakings were then set on foot partly to remedy the defects of the existing system. Everywhere it became a primary object to establish the most direct lines of communication between important places of industry and commerce. As a consequence, the German railroad system was immensely enlarged, and from 1865-75 it was nearly doubled. On December 31, 1899, Germany had 31,492 miles; Great Britain and Ireland, 21,855; France, 23,710. The total length of the railroads open to traffic in 1887 was 24,197 miles, of which 1,112 miles belonged to the state. The government is rapidly acquiring all the remaining lines now owned and operated by private companies. The total amount expended in the construction of German railroads to the end of 1886 was 9,472,606,000 marks. The receipts for 1899 were 1,954,963,000 marks, and the expenses 1,202,642,000 marks; showing a net profit of 4.42 per cent. on the capital.

Area and Population.—The area of Germany is 208,830 square miles, and its population, December 1, 1901, was 56,367,178, of whom 27,933,664 were males, and 28,922,040 females. The average density of the population was 269 per square mile. The bulk of the population is Teutonic, but there were 3,205,000 non-Germanic inhabitants, including 2,454,000 Slavs; 2,800,000 Walloons and French; 150,000 Lithuanians; 140,000 Danes, and 140,000 Wends, Moravians and Bohemians. In 1900, 20,371 persons emigrated from the German Empire by way of German ports and Antwerp, 11,114 of whom were males, and 9,257 females; there were 2,440 families, comprising 8,387 persons.

The United States received 19,703; Brazil, 364; British North America, 330; other American countries, 474; Africa, 183; Asia, 1; and Australia, 196. In addition to the above total, 188 Germans left the empire by way of Rotterdam, Amsterdam and Havre, in 1896. The number of emigrants from the empire, in 1887, was 99,712. On December 1, 1896, there were 486,190 foreigners in Germany.

Commerce and Industry.—The total export trade of the empire in 1901 was valued at 4,759,407,000 marks, against 3,127,655,275 marks in 1886.

The imports amounted to 6,042,992,000 marks in 1900, and to 5,967,017,000 in 1901.

Protective duties on grain and cattle were imposed in 1879, which had the effect of increasing the receipts of the treasury from the duties on cereals from 14,300,000 to 30,600,000 marks, and from the cattle duties from 1,021,500 to 4,590,750 marks. Nevertheless, they had failed to protect German agriculture from the competition of foreign countries where production is much cheaper. The duties were raised in 1885 still higher, but without producing the desired effect. Wheat, instead of rising, fell to a price unknown for a century. The Central Council of Agriculture, therefore, called for a further measure to preserve the agricultural interests of Germany, both large and small, from the ruin with which they were menaced. The government proposed to double the existing duties, but the Reichstag, in the measure that was finally passed, slightly reduced this proposal. The new tariff fixes the duty on wheat and rye at about 40 cents a bushel; on oats and malt, 31

cents; on barley, 18 cents; on buckwheat, legumes and Indian corn, 16 cents. Farinaceous preparations pay duties from 30 to 50 per cent. higher than formerly.

In 1900-01, there was under cultivation a total area of 104,989,560 acres. The leading agricultural products were, wheat, 2,933,065 tons, produced from 4,791,583 acres; rye, 6,702,134 tons, from 14,596,255 acres; barley, 2,570,921 tons, from 4,328,600 acres; oats, 5,341,483 tons, from 9,615,337 acres; potatoes, 27,657,340 tons, from 7,289,307 acres; clover, hay, etc., 28,242,253 tons, from 21,367,500 acres; wines, 33,066,594 gallons, from 300,752 acres; tobacco, 81,166,000 pounds, from 49,000 acres. The product of raw and refined sugar was, 1,418,900 tons. The total value of the mineral products in 1886 was 463,000,000 marks. The value of coal raised was 300,727,000 marks; lignite, 40,270,000 marks; iron ore, 29,642,000 marks; zinc ore, 7,722,000 marks; lead ore, 15,919,000 marks; copper ore, 14,415,000 marks; silver and gold, 3,977,000 marks; mineral salts, 13,427,000 marks; other salts, 35,024,000 marks. In 1899 the value of the pig-iron produced in Germany was 455,875,000 marks—229 furnaces being in operation. The finished iron was valued at 418,727,000 marks, and the total value of the production of foundries of all kinds was 701,043,000 marks. In the manufacture of iron 286,597 men were employed.

German Colonies.—Germany had no dependencies beyond the seas before 1884. Since that time she has established protectorates over extensive regions in Africa and many islands in the Pacific Ocean. In 1884, Pogoland, on the slave coast of West Africa, with Porto Seguso and Little Popo, in all about 400 square miles, with 40,000 inhabitants and a trade of \$1,200,000 a year, were annexed, and in the same year the German flag was raised over the Cameroon region, extending for 300 miles along the coast, from Rio del Rey on the north to the River Campo on the south, and in the interior to 150° of east longitude, comprising 120,000 square miles. Damaraland and Namaqualand, in South Africa, were taken under German protection between 1884 and 1886, embracing a territory of 230,000 square miles, with 200,000 native inhabitants.

In East Africa the territory acquired by the German East African Society in Usagora and the neighboring districts, comprising 20,700 square miles, was made a German protectorate in 1885 by the *Schutzbrief*, a protecting charter by the emperor. In the same year Wituland, 5,200 square miles, was added, and in 1886, by virtue of an agreement with Great Britain and Zanzibar, the German Government established a protectorate over 122,800 square miles of territory in East Africa. The German acquisitions extend from Kilimanjaro mountain on the north to the River Rovuma in the south. The total area in Africa that has been brought under German domination is about 740,000 square miles, not including 200,000 square miles in East Africa, over which German traders claim to have secured territorial rights, comprising the districts of Khutu, Usambara, Para, Ugono, Arusha, Djagga, Usavamo, Ulena, Wamatshonde, Mahenge, Magindo, Girijania, Sabaki, the Galla country, and Ukamba Gasi. The districts that were included in the protectorate before 1888 are Usagara, Ukami, Nguru, and Usega. In accordance with a treaty made with the sultan of Zanzibar on April 28, 1888, the German East Africa Company has acquired a fifty years' lease of the entire strip of coast, with rights to all duties and tolls, whereas previously the possessions of the company were cut off from the sea, and it had only a concurrent right to use the two harbors of Dar-es-Salam and Pangani. The region south of Tana is inhabited by the

peaceful Suaheli tribes, while north of that river, in the Galla country, and on the Somali coast, dwell the warlike and predatory Galla and Somali tribes. The little sultanate of Witu, which lies immediately north of Tama, is administered by a company connected with the German Colonial Association. The territory that came under German dominion by arrangement with Great Britain is bounded by a line passing from Witu to Fungasombo and Mknumbi, and then running to the ocean, which it strikes at a point between the mouth of Mknumbi and Osi rivers. The boundary on the other side ascends the Osi as far as Kau, and then the river Magogoni to its source, whence it follows a straight line to Witu. The soil is well watered and fruitful, and on the coast are several good harbors. The Germans expect to find a rich field of commerce in Somaliland. The country produces gum-arabic, frankincense, myrrh, and other aromatic resins and herbs, coffee of the finest quality, honey and wax, ostrich feathers, ivory, dye woods, pharmaceutical plants, cloves, coconuts, sesame, earth nuts, palm oil, and gum copal, and on the plateau that forms the interior the Bedouins and Somali tribes raise herds of camels that they count by thousands, as well as sheep and goats, cattle and asses, in vast numbers, and all ride Arab horses of purest race. There is now a large export of cattle, hides and butter. In the Suaheli country the Germans have experimented in the cultivation of cotton, tobacco, sugar, vanilla, pepper, nutmeg and indigo. The results proved very fair. The German East African Plantation Society has 62,000 acres planted, and has adopted a system of modified slavery, contracting with Indian traders, who furnish gangs of 150 negroes for terms of two years, the contractors feeding, housing and overseeing the laborers.

The northern part of southeastern New Guinea, lying between Humboldt Bay and Huon Gulf, with an area of 70,300 square miles and an estimated population of 109,000 souls, was made a German possession during 1885 and 1886, and given the name of Kaiser Wilhelm's Land. New Britain and other islands lying between 141° and 154° of east longitude and between 8° of south latitude and the equator, having a land surface of 18,150 square miles and 188,000 inhabitants, were annexed in 1885 and called Bismarck Archipelago. In 1886 were added the islands of Bougainville, Choiseul, Isabel, and others in the northern part of the Solomon group, with an area of 8,500 square miles and a population of 80,000 persons. The Marshall islands, having an area of forty-two square miles and about 10,000 inhabitants, were included in the acquisitions of 1885. The Providence and Cron groups have also become German territory. Kaiser Wilhelm's Land is the field of operations for a trading and colonization society called the New Guinea Company, which has stations on the coast of Finch-Haven and Constantine and Hatzfeld harbors. The islands of the Bismarck Archipelago produce copal, or dried coconut, of which 1,500 tons were exported in 1885, mother of pearl and trepang. In New Guinea there have been several collisions with the natives, who have no rifles, but use the bow and the spear with great dexterity.

Army.—By the constitution of April 16, 1871, every German is liable to service, and no substitution is allowed. Every German capable of bearing arms has to serve in the standing army for seven years—as a rule, from the end of the twentieth till the commencement of the twenty-eighth year of his age. Three of these years he must spend in the active service, and the remainder in the reserve; after getting the latter he forms part of the landwehr for five years more—the full time of military service thus being twelve years.

The peace strength of the German army in 1901-02 was 24,145 officers, 580,023 rank and file, 104,485 horses and 1,374 guns. The new army law of March 11th renewed the septennate, which is to continue till March 31, 1894, and added 50,000 soldiers to the regular military establishment, fixing the peace strength of the army at 468,409 rank and file, and 23,991 officers, surgeons, paymasters, etc. The war strength of the army is 1,567,600 officers and men, 312,730 horses, and 2,958 guns. To these numbers may be added the landsturm, and one-year volunteers, together numbering 1,082,400 officers and men, and the untrained men capable of serving in the army numbering 3,020,000, making the total available force in time of war 5,670,000 officers and men. The railway and telegraph service in time of war numbers 1,238 officers, 7,000 men, and 5,400 horses.

The Prussian contingent of the German army had a peace strength, in 1887-88, of 361,902 officers and men.

The empire is divided into nine fortress districts, in which there are seventeen fortified places of the first class and twenty-six other fortresses.

The German infantry wear lighter helmets than formerly, and their new magazine rifles are fitted with small knife-like bayonets. The cuirassiers have laid aside their cuirass, and are now armed with the lance, like the uhlands, and the same weapon is being adopted for the hussars.

General Field-Marshal Count von Moltke, chief of the general staff of the German army since September 18, 1858, resigned his position on August 3, 1888, on account of old age, and Emperor William II. appointed as his successor General Count von Waldersee, who was born in 1832, first served on the general staff in 1866, was made a colonel for his services in the Franco-Prussian war, and was appointed quartermaster-general in 1882, in connection with which post he had acted as deputy chief of the general staff and aide-de-camp general to the emperor.

Navy.—The German navy is of but recent origin. In 1848 the German people urged the construction of a fleet. Money was collected, and a few men of war fitted out, but these were subsequently sold, the German bundestag (federal council) not being in sympathy with the nation. Prussia, however, began to lay the foundation of a small navy. In 1864 Prussia, by annexing Holstein, obtained possession of the excellent port at Kiel, which has since been strongly fortified. From the time of the formation of the North German confederation, the navy has belonged to the common federal interest. Since 1868 it consisted of eighty-nine vessels of five hundred and sixty-three guns. Since then a definite plan for the further development of the navy has been set on foot, and great activity has been displayed in fitting out ships and in augmenting its personnel.

In 1902 the naval forces of the empire consisted of 241 vessels, of an aggregate displacement of 901,521 tons, mounting six hundred and five guns. The iron-clad navy comprises 15 battleships, 19 coast defence ships, 18 cruisers, 27 destroyers. The number of first and second class torpedo boats that were completed was one hundred and forty, and others were building. The larger vessels in course of construction on January 1, 1888, were two frigate cruisers of 4,800 tons, three corvettes, a transport, and two dispatch-boats, one of which was completed in July. The personnel of the navy on January 1, 1902, consisted of seven admirals; twelve hundred officers, including engineers and surgeons; and 27,024 non-commissioned officers, marines and sailors. The total expenditure involved by the shipbuilding and other estimates of the year was \$250,000,000. Besides the port of Kiel, Germany has two other ports, Dantzig and Wilhelmshaven. In the naval maneuvers the

last-named port was subjected to a sham attack, which was repelled in a way to prove in the eyes of the umpires that the place was impregnable. When William II. succeeded to the throne, the project of a further development of the iron-clad navy by adding to the number of armored battleships and replacing with modern vessels those of obsolete type came into favor, and General von Caprign, who had given his attention chiefly to coast defenses and unarmored fast cruisers, retired from the naval office, to be succeeded by Vice-Admiral Count von Monts, who has undertaken to build up a navy that shall be superior to that of any of the second-rate naval powers, not even excepting Italy, for offensive as well as defensive purposes.

In the naval budget estimates for 1889-90 the government proposed the expenditure, in the space of six years, of 116,800,000 marks on the construction of twenty-eight new vessels, four of which will be first-class ironclads of the latest designs, costing 9,300,000 marks each; seven are to be protected cruisers, costing 5,500,000 marks each; and of the others four will be unprotected cruisers, two avisos and two torpedo division boats.

Finances.—The budget for the year ending March 31, 1902, estimates the receipts of the German empire at 2,311,980,000 marks, derived from the following sources:

Sources of Revenue.	Marks.
Customs and Excise Duties.....	810,331,000
Stamps.....	114,020,000
Posts and Telegraphs.....	420,163,000
Printing Office.....	7,777,000
Railways.....	93,676,000
Imperial Bank.....	14,714,000
Departmental Receipts.....	26,465,000
Interest of Invalid Fund.....	30,449,000
Extraordinary Receipts.....	206,654,000
Federal Contributions.....	570,933,000
Other Contributions.....	16,798,000
Total.....	2,311,980,000

The estimated ordinary expenditure is 1,914,923,000 marks. The following are the principal items:—Expenditures for the army, 559,628,000 marks; navy, 79,896,000 marks; imperial treasury, 578,196,000 marks; interest on the national debt, 88,543,000 marks; pension fund, 70,995,000 marks; invalid fund, 26,359,414 marks.

The estimated extraordinary expenditure includes a deficit of 22,157,246 marks in the finances of 1886-87; 77,267,954 marks of expenditure for military purposes; 12,920,318 marks for the interior. The federal contributions toward the revenue of 1901-02 were 570,933,000 marks.

The total funded debt was estimated to be 2,298,500,000 marks in March, 1900. The whole debt bears interest at 3½ per cent. There was also an unfunded debt of 120,000,000 marks on April 1, 1900. As an offset to the public debt there are several invested funds, amounting to 503,241,100 marks. These include the invalid fund, the fortification fund, the parliamentary buildings fund, and the war treasure of 120,000,000 marks.

Canals.—Germany has not many canals. In South Germany the Ludwigs canal was, until the annexation of Alsace-Lorraine, the only one of importance. It extends from the Main at Bamberg to Kelheim on the Danube. Alsace-Lorraine has canals for connecting the Rhine with the Rhone and the Marne. In the east of the North German plain a canal by which Russian grain is conveyed to Königsberg, joins the Pregel to the Memel. The Netze canal unites the Vistula and the Oder. The upper Silesian coal field is in communication with the Oder by means of a canal. The greatest number of canals is found around Berlin; they serve to join the Spree to the Oder and Elbe. The Meuse and the

Rhine are also connected by a canal. By 1895 the Baltic and North Sea ship canal will be completed. It is intended primarily for strategical purposes, but will also facilitate navigation and commerce in this part of Europe, and alter the course of trade in favor of Germany. The canal will run from Holtenau, in the Gulf of Kiel, in a southwesterly direction, by way of Rendsburg, to a point on the Elbe, below Hamburg, about half way between Brunsbüttel and St. Margarethen. Its length will be sixty-one miles, its breadth at the surface of the water one hundred and ninety-six feet, and at the bottom eighty-four feet, and its depth twenty-seven feet. There will be one lock at each end. It is intended in the future to extend the ship canal from the Elbe across the northern part of Hanover to the Jade, on which Wilhelmshaven is situated, which will enable ships of war to pass between that port and Kiel without going to sea, and afford means of communication between all the German naval ports, even if an enemy held entire command of the German Ocean.

Religion.—Almost two-thirds of the population belong to the Evangelical Church, and rather more than a third to the Church of Rome. The dissenters are very inferior in numbers, amounting to only about 100,000 souls, but the Jewish element, represented by half a million (1¼ per cent.), is more considerable than in any other state of West, North or South Europe.

The adherents of Protestantism are divided by their confessions into Reformed and Lutheran. To unite these the "church union" has been introduced into several Protestant states, as for example in Prussia and Nassau in 1817, in the Palatinate in 1818, and in Baden in 1822. Since 1817 the distinction has accordingly been ignored in Prussia, and Christians are there enumerated only as Evangelical or Catholic. The union, however, has not remained wholly unopposed—a section of the more rigid Lutherans who separated themselves from the state church being now known as Old Lutherans. In 1866 Prussia annexed Hanover and Schleswig-Holstein, where the Protestants were Lutherans, and Hesse, where the Reformed Church had the preponderance. The inhabitants of these countries opposed the introduction of the union, but could not prevent their being subordinated to the Prussian oberkirchenrath (high church-council), the supreme court of the state church.

There are six Roman Catholic archbishops within the German empire—Breslau (where the archbishop has the title of prince-bishop), Gnesen-Posen, Cologne, Freiburg (Baden), Munich-Freising, and Bamberg. The eighteen bishops are—Ermland (see at Frauenburg, East Prussia), Kulm (see at Pelplin, West Prussia), Fulda, Hildesheim, Osnabrück, Paderborn, Münster, Limburg, Treves, Metz, Strasburg, Spire, Würzburg, Ratisbon, Passau, Eichstädt, Augsburg, Rottenburg (Württemberg). An apostolic vicarage exists in Dresden. In recent years numerous convents, especially in Prussia, have been suppressed. The order of the Jesuits is interdicted in Germany.

Old Catholics.—After the infallibility of the pope had been proclaimed as a dogma by the Vatican council in 1871, several communities as well as individuals declared their secession from the Roman Church. They are called Old Catholics, and they have selected a bishop who has been acknowledged by most of the states. January 1, 1877, the denomination had 121 congregations with fifty-six clergymen and 16,557 adult male adherents, so that we may fairly estimate the total number of Old Catholics at a little more than 50,000.

The number of Greek Catholics was 2,660 in 1871.

Language.—The German-speaking nations, in their various branches and dialects, are found to extend in

compact mass along the shores of the Baltic and of the North Sea, from Memel in the east to a point between Gravelines and Calais, near the Straits of Dover. On this northern line, the Germans come in contact with the Danes who inhabit the northern parts of Schleswig within the limits of the German empire. A line from opposite Sonderburg, in the isle of Alsens to Tondern in the west, will nearly form the boundary between the two idioms. The German-French frontier traverses Belgium from west to east, touching the towns of St. Omer, Courtrai, and Maastricht. Near Eupen, south of Aix-la-Chapelle, it turns southward, and near Arlon southeast as far as the crest of the Vosges mountains, which it follows up to Belfort, traversing there the watershed of the Rhine and the Doubs. In the Swiss territory the line of demarkation passes through Biel, Freiburg, Saanen, Leuk, and Monte Rosa. In the south the Germans come into contact with Rhetoromans and Italians, the former inhabiting the valley of the Vorder-Rhein and the Engadine, while the latter have settled on the southern slopes of the Alps, and are continually advancing up the valley of the Adige. Carinthia and Styria are inhabited by German people, except the valley of the Drave toward Klagenfurt. Their eastern neighbors there are first the Magyars, then the northern Slavs and the Poles. The whole eastern frontier is very much broken, and cannot be described in a few words. Besides detached German colonies in Hungary, the western parts of that country are held by Germans. The river March is the frontier north of the Danube from Presburg as far as Brünn, to the north of which the German regions begin near Olmütz—the interior of Bohemia and Moravia being occupied by Czechs and Moravians. In the Prussian provinces of Silesia and Posen the eastern parts are mixed territories, the German language progressing slowly among the Poles. In Bromberg and Thorn, in the valley of the Vistula, German is prevalent. In West Prussia, some parts of the interior, and in East Prussia, a small region along the Russian frontier, are occupied by Poles (Kassubians in West Prussia, Masurians in East Prussia). The German tongue is also fast invading the Lithuanian territory, and in a short time no people speaking that idiom will be found to the left of the river Memel. The total number of German-speaking people, within the boundaries wherein they constitute the compact mass of the population, may be estimated, if the Dutch and the Flemings be included, at fifty-six millions.

The geographical limits of the German language thus do not quite coincide with the German frontiers. The empire contains about three and one-third millions of persons who do not make use of German in everyday life, not counting the 290,000 resident foreigners. The non-German languages have their representatives only in Prussia, Saxony, and Alsace-Lorraine.

Education.—In point of intellectual culture Germany ranks high. Much is done by the government for the promotion both of primary and secondary education. Elementary education is general and compulsory throughout Germany. In 1886 only 1.06 per cent. of the recruits of the army could neither read nor write. Among 169,240 recruits, which was the number that entered the army in 1887, there were 163,203 who had received an education in Germany, 4,822 were educated in some foreign language, and 1,215 were illiterate. In 1881 there were 57,000 elementary schools, with 7,100,000 pupils, in Germany. In 1885 there were 347 normal schools, with 26,281 pupils; 858 gymnasias, with 186,766 students; and 270 realschulen, with 49,196 students. In addition there were, in 1887, nine technical high schools, with 2,985 students; and 4,346 industrial and special schools.

There are twenty-one universities in Germany, with a total number of professors and pupils, respectively, of 1,913 and 20,826.

All the universities have four faculties (except Münster). As regards theology, Bonn, Breslau and Tübingen have both a Protestant and Catholic faculty; Freiburg, Münster, Munich and Würzburg are exclusively Catholic; and all the rest are Protestants. As to the number of students Berlin takes the lead, with 5,431 (in 1901). Munich follows, with 4,494, and Leipsic, with 3,517. Other universities with over a thousand students are Halle (1,713); Tübingen (1,489); Würzburg (1,108); Breslau (1,770); Bonn (2,240); Freiburg (1,766); Greifswald (820); Göttingen (1,409); Marburg (1,231). The oldest university is Heidelberg, being founded in 1386; then come Leipsic, founded in 1409; Greifswald, dating from 1456, and Tübingen from 1477. The youngest universities are Breslau and Berlin, dating from 1811 and 1810, respectively.

Mental culture and a general diffusion of knowledge are extensively promoted by means of numerous public libraries established in the capitals, the university towns and other places. The most celebrated public libraries are those of Berlin (800,000 volumes), Munich (800,000 volumes and 22,000 manuscripts), Göttingen, Dresden, Stuttgart, Hamburg, Strasburg, Frankfort-on-the-Main, Breslau, Gotha, and Wolfenbüttel.

There are also numerous societies and unions, some being of an exclusively scientific character, and others being designed for the popular diffusion of useful knowledge. The academies of science in Berlin, Munich, Göttingen, and Leipsic are government institutions.

There are twenty-two observatories in the empire, viz., at Altona, Berlin, Bonn, Bothkamp in Schleswig, Breslau, Dantzic, Düsseldorf, Gotha, Göttingen, Hamburg, Kiel, Königsberg, Liepsic, Lübeck, Mannheim, Marburg, Munich, Potsdam, Schwerin, Spire, Strasburg, and Wilhelmshaven.

The book trade, from the important position it has gradually acquired since the time of the Reformation, is to be regarded as at once a cause and a result of the mental culture of Germany. Leipsic is the center of the trade. The number of booksellers in Germany was not less than 5,196 in 1878, among whom were 1,546 publishers.

While in England a few important newspapers have an immense circulation, the newspapers of Germany are much more numerous, but individually command a far more limited sale. Leaving out of account insignificant local papers, Germany in 1878 possessed 600 newspapers published daily, or two to three times a week; of these only ninety were published in South Germany. Berlin alone produces forty-four newspapers. Most readers receive their newspapers through the postoffice or at their clubs, which may help to explain the smaller number of copies sold. Only fifty of the six hundred daily newspapers print more than 10,000 copies, and only twenty more than 20,000.

There are many academies which have for their object the promotion of a taste for painting, sculpture, architecture, and music, and the improvement of the technique of art. The largest academy is now that of Berlin. The three schools of painting are represented by the academies of Berlin, Munich, and Düsseldorf. Other academies for painting are to be found in Dresden, Carlsruhe, Weimar, and Königsberg. The chief musical academy is at Leipsic.

The earliest information we have of the Germans, the peoples and tribes who dwelt among the dense forests that stretched from the Rhine to the Vistula and from the Danube to the Baltic Sea, comes to us from the

Romans, the principal authority being Tacitus. The term Germans is of Celtic origin, though its meaning is not precisely known. It was in all probability borrowed by the Romans from the Gauls. The Germans were not one homogeneous nation, but a multitude of separate and independent tribes, who had racial origin, language, and similarity in their mode of life for their only links of connection. The first tribes of Germanic race to come into collision with the arms of Rome were the Cimbri and Teutones, who in 113 B.C. had invaded Styria, and there met with defeat from the troops of the consul Papirius. The next Roman general who made trial of their prowess was Caesar. When in 58 B.C. he began his campaigns in Gaul, he found several hordes of Germans, mostly Marcomanni and Suevi, settled between the Rhine and the Vosges, and even on the western side of these hills. Appealed to by the Gauls of those regions to free them from their German oppressors, Caesar, in spite of the redoubtable stature and strength of his enemies, and of their personal valor, inflicted a crushing defeat upon their ambitious chieftain, Ariovistus, and chased him and his followers across the Rhine. Then, continuing his campaign, he drove back (55 B.C.) behind the same river those tribes that had settled on its western side in Belgium, and even followed them into their original seats in Germany in two short campaigns. The tranquillity which was established through his exertions was, however, so seriously disturbed again by 15 B.C. that Augustus felt it necessary to make a serious effort to subjugate these troublesome neighbors of Gaul. Accordingly Drusus was sent (12 B.C.) at the head of eight legions across the frontier; and in four campaigns he was so far successful that he subdued the Batavians, Frisians, and other tribes as far as the Elbe, and likewise the Chatti on the Main. After the death of Drusus in 9 B.C. Tiberius conquered the Tenteri and Usipetes, who lived on the middle Rhine, and afterward the Sicambri and others settled on the lands at its mouth. In 6 A.D. the work was taken up by Varus; but Varus, in attempting to consolidate the Roman power by depriving the Germans of their national institutions and imposing upon them those of the empire, provoked a general revolt of the subject peoples. The animating spirit of this patriotic movement was Arminius, chief of the Cherusci, who not only overthrew Varus, and slew him and his legions (9 A.D.) at one blow in the Teutoburg Forest, but with irresistible *élan* swept the Romans before him until he had expelled them from German soil. The struggle was renewed by Germanicus, who defeated Arminius and avenged the Roman honor, but at length, in 16 A.D., withdrew his legions. Henceforth the Romans contented themselves with guarding their long frontier next Germany; and in this task they succeeded for some time as much by stirring up dissension among the chiefs of their foemen as by their own military skill. Yet they managed to bring the Frisians and Batavians under their influence, until in 69 a fierce revolt broke out among the latter people, a revolt which was only quelled after a terrible struggle. About one hundred years later the Germans began to reverse the order of things. In the period 166-174 Aurelius was engaged in beating back a formidable incursion of the Marcomanni and Quadi into Roman territory. From the third century we no longer read of single tribes, but of great confederations of tribes, as the Goths, Alemanni, Franks, Frisians, Saxons, Thuringians, and others. These powerful combinations began to harass the Romans all along their frontier line, from the mouth of the Rhine to the middle Danube, attacking the towns and forts, and breaking down the walls they had built to keep this boundary. In 375 began

the movement before which Rome eventually succumbed. The Huns invaded Europe, and by their coming gave rise to what is known as the "Volkerwanderungen" or "Migrations of the Peoples." The races who lay next to Roman territory were being pressed upon more and more by those behind, upon whom the full brunt of the Hunnic attack had fallen, and at last they began to pour across the boundary in such broad deep streams that the dams of the Romans were broken completely down before their onrush. Of the history of Germany itself we learn little more that is authentic until we come down to the times of the Franks, except that the Slavic nations following in the wake of the Huns seized and occupied the lands left vacant by the German emigrants who had gone Romeward, and that of the confederations still remaining at home in their original lands the most important were the Alemanni, the Thuringians, Saxons, Bavarians, and Franks. The historian turns his attention more especially toward the last-named, since by them the kingdoms of France and Germany were subsequently formed.

After the gradual expulsion or retirement of the Romans from Germany, the country necessarily became subdivided into numerous petty states, each governed by its own chief. The erection of the Franko-Merovingian empire in France had given preponderance to the Frankish power on both sides of the Rhine, and when Charlemagne succeeded in 771 to the German as well as the Gallic possessions of his father, Pepin the Short, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of the west of Germany, while his conquests over the heathen Saxons in the north, and the Avars who then held Pannonia in the southeast, extended his German dominions from the North Sea to the Alps, and from the Rhine as far as Hungary. With Charlemagne, who received the imperial crown at the hands of the pope in 800, began the long line of emperors and kings who occupied the German throne for more than a thousand years; and with him, too, ended the stability of the vast fabric which he had reared on the ruins of Roman power, for at his death in 814, no member of his family was competent to wield the imperial scepter. Although in 843 some portions of his German possessions fell, in accordance with the treaty of Verdun, to his grandson Ludwig, surnamed "the German," who was recognized as king of Germany or East Francia, the final and absolute partition did not take place till 887, when Arnulf seized the eastern throne. On the extinction, in 911, of the degenerate Carolingian dynasty in the person of Ludwig "the Child," the provincial rulers, who, together with the archbishops, bishops and abbots, constituted the chief members of the diet or national assembly, arrogated to themselves (in imitation of the practice of the nobles of the ancient German tribes) the right of electing their sovereign, who, however, could not assume the imperial title till he had been crowned by the pope. At this period there were in Germany five nations—the Franks, Saxons, Bavarians, Swabians, and Lorrainers. The Franks, as the descendants of those who had conquered the land and founded the empire, enjoyed a preëminence over the others; and hence, on the extinction of the Carolingian race, the choice of the prince-electors seems to have fallen almost as a matter of course on the chief of the Franks, the Duke of Franconia, who reigned as king of Germany from 911 to 918, under the title of Conrad I. At his own instigation, his rival and adversary, Henry, Duke of Saxony, was chosen as his successor, and proved himself an able and warlike prince. The conquests of this great prince over the Danes, Slavs, and especially

over the terrible Magyars, were confirmed and extended by his son and successor, Otho I. (936-973), who carried the boundaries of the empire beyond the Elbe and Saale, and who, by his acquisition of Lombardy, laid the foundation of the relations which existed for many ages between the rulers of Germany and the Italian nation. Otho's coronation-festival was eventful, as it formed the precedent for the exercise of those offices which, till the dissolution of the empire were regarded as connected with the dignity of the secular electors; for on that occasion, while the emperor dined with his three spiritual electors, he was waited upon by the secular princes—the Elector of Bavaria (afterward of Saxony) serving as grand-marshal; of Swabia (afterward of Bohemia), as grand-cupbearer; and of Lorraine (afterward of Brandenburg), as arch-chamberlain.

Otho II. (973-983), Otho III. (983-1002), and Henry II. (1002-24) belonged to the House of Saxony, and which was succeeded by that of Franconia, in the person of Conrad II. (1024-39), an able ruler, who added Burgundy to the empire. His son and successor, Henry III. (1039-56), temporarily extended German supremacy over Bohemia, Denmark, and Hungary, while he repressed the insolence and despotism of the great nobles of Germany. And while his stern piety moved him to interfere with force in the strife over the papal chair, he also gained the respect of his contemporaries by his zeal for justice and his valor in the field. The minority of his son and successor, Henry IV. (1056-1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the imperial authority, which had been considerably extended under the two preceding reigns. Henry's constant quarrels with the astute Gregory VII. entangled him in difficulties and mortifications, which culminated in his humiliation at Canossa, and only ended with his life, and which plunged Germany into anarchy and disorder. The emperor's most formidable rival, Rudolph of Swabia, was defeated and slain in 1080. With his son and successor Henry V. (1106-25), who made peace with the papacy by the Concordat of Worms in 1122, the male line of the Franconian dynasty became extinct; and after the crown had been worn (1125-37) by Lothair of Saxony, who made a bold attempt to recover some of the prerogatives of which at his election the empire had been deprived through papal intrigues, the choice of the electors, after a season of dissension and intrigue, fell upon Conrad III. (1138-52), Duke of Franconia, the first of the Hohenstaufen dynasty. His reign, in which the civil wars of the GUELPHS (*g.v.*) and Ghibellines began, was distracted by the dissensions of the great feudatories of the empire, while the strength of Germany was wasted in the disastrous Crusades, in which Conrad took an active part. On his death the electoral college for the first time met at Frankfort, which retained the honor of being the place at which the sovereign was elected and crowned till the dissolution of the empire in the nineteenth century. Frederick I. (1152-90), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle Conrad, chosen as his successor, and the splendor of his reign fully warranted the selection. By the force of his character Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and counties of Germany, while we now for the first time hear of the *hereditary* right possessed by certain princes to exercise the privilege of election. Unfortunately for Germany, this great monarch suffered the interests of his Italian dominions to draw him away from those of his own country, while

his participation in the Crusades, in which both he and the flower of his chivalry perished, was only memorable for the misfortunes which it entailed on the empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolf I. (1273), the first of the Hapsburg line, which, through a female branch, still reigns in Austria, was one of constant struggle, internal dissension, and foreign wars. Individually, the princes of the Hohenstaufen dynasty were popular monarchs, their many noble and chivalrous qualities having endeared them to the people, while one of the race, Frederick II. (1212-50), was, after Charlemagne, perhaps the most remarkable sovereign of the middle ages; but their ambitious designs on Italy, and their constant but futile attempts to destroy the papal power, were a source of misery to Germany, and with Frederick II. ended the glory of the empire, till it was partially revived by the Austrian House of Hapsburg. His son, Conrad IV. (1250-54), with whom the Hohenstaufen line ended in Germany, was succeeded, after a brief and troubled reign, by various princes, who in turn, or in some cases contemporaneously, bore the imperial title without exercising its legitimate functions or authority. This season of anarchy (known as the Great Interregnum) was terminated at the accession of Rudolf I. (1273-91), who, by the destruction of the strongholds of the nobles, and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandizement of his Austrian possessions, which embraced Styria, Carinthia, Carniola and Tyrol.

For the next 200 years the history of the German empire presents very few features of interest, and may be briefly passed over. Adolf of Nassau, who was elected to succeed Rudolf, was compelled in 1298 to yield the crown to the son of the latter, Albert I. (1298-1308), whose reign is chiefly memorable as the period in which three Swiss cantons, Unterwalden, Schwyz and Uri established their independence. After the murder of Albert the throne was occupied in rapid succession by Henry VII. (1308-13), who added Bohemia to the empire, and, conjointly, by Frederick III. of Austria and Ludwig IV. of Bavaria (1313-47). Charles VI. (1347-78) of Luxemburg was the successful candidate among many rivals; and, although he attended specially to the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the empire, for which he provided by a written compact, known as the *Golden Bull* (1356) which regulated the rights, privileges, and duties of the electors, the mode of the election and coronation of the emperors, the coinage, customs, and commercial treaties of the empire, and the rights and obligations of the free cities. His son, Wenceslaus (1378-1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Rupert of the Palatinate (1400-10). The nominal reign of Sigmund (1410-37), the brother of Wenceslaus, would demand no notice were it not for his connection with the Council of Constance in 1414, at which Huss was condemned, and which was followed by the disastrous Hussite wars. The readiness with which Sigmund lent himself to the interests of Henry V. of England, and of all other princes who ministered to his love of personal display, brought discredit on the imperial dignity, while his dishonorable desertion of Huss will ever attach ignominy to his name. Albert II. of Austria (1438-39), after a reign of less than two years, in which he gave evidence of great capacity for governing, was succeeded by his cousin, Frederick IV. (1440-93), an accomplished but avaricious and indolent prince, whose chief object seemed to be the aggrandizement of the House of Hapsburg,

with which the title of emperor had now become permanently connected (see AUSTRIA), while he neglected the interests of Germany collectively, and suffered the Turks to make unchecked advances upon its territory. Maximilian I. (1493-1519), the son and successor of Frederick, resembled him in few respects, for he was active, ambitious, and scheming, but deficient in steadiness of purpose. His marriage with Mary, the rich heiress of her father, Charles the Bold of Burgundy, involved him in the general politics of Europe, while his opposition to the reformed faith preached by Luther exasperated the religious differences which disturbed the close of his reign. Maximilian had, however, the merit of introducing many improvements in regard to the internal organization of the state, by enforcing the better administration of the law, establishing a police and an organized army, and introducing a postal system. With him originated, moreover, the special courts of jurisdiction known as the "Imperial Chamber" and the "Aulic Council;" and in his reign the empire was divided into ten circles, each under its hereditary president and its hereditary prince-covoker. Maximilian lived to see the beginning of the Reformation, and the success that attended Luther's preaching; but the firm establishment in Germany of the reformed faith, and the religious dissensions by which its success was attended, belong principally to the reign of his grandson, Charles I., king of Spain, the son of the Archduke Philip and of Joanna, the heiress of Spain, who succeeded to the empire under the title of Charles V. (1519-56). The management of his vast possessions in Spain, Italy, and the Netherlands, and the wars with France, in which he was so long implicated, diverted him from his German territories, which he committed to the care of his brother Ferdinand. The princes of Germany were thus left to settle their religious differences among themselves, and to quell, unaided by the head of the state, the formidable insurrection of the peasants (1524-25), which threatened to undermine the very foundations of society, and which had followed close upon the nobles' war (1522-23), raised by Ulrich von Hutten and Francis von Sickingen in the vain hope of securing a more united Germany under the emperor. The rising of the lower orders was due to the preaching of the fanatic Münster, and other leaders of the sect of Anabaptists, which had arisen from a perverted interpretation of some of the tenets advanced by Luther. Charles' determined opposition to the reformers rendered all settlement of these religious differences impracticable; and although, by the aid of his ally, Maurice of Saxony, he broke the confederation of the Protestant princes known as the League of Schmalkald, he was forced by his former ally to sign the peace of Augsburg in 1555, which granted tolerance to the Lutherans; and, in his disgust at the complicated relations in which he was placed to both parties, he abdicated in favor of his brother Ferdinand (1556-64), who put an end to much of the religious dissension that had hitherto distracted the empire, by granting entire toleration to the Protestants. Although Ferdinand was personally mild and pacific, his reign was troubled by domestic and foreign aggressions—the different sects disturbing the peace of the empire at home, while the French and the Turks assailed it from abroad.

During the next fifty years the empire was a prey to internal disquiet. Maximilian II. (1564-76) was indeed a wise and just prince, but the little he was able to effect in reconciling the adherents of the different churches, and in raising the character of the imperial rule, was fatally counteracted by the bigotry and vacillation of his son and successor, Rudolf II. (1576-1612), in whose reign Germany was torn by the dissensions of

the opposite religious factions, while each in turn called in the aid of foreigners to contribute toward the universal anarchy which culminated in the Thirty Years' War, begun under Rudolf's brother and successor, Matthias (1612-19); continued under Ferdinand II. (1619-37), an able, but cruel and bigoted man; and ended under Ferdinand III. (1637-57), by the treaty of Westphalia, in 1648. The effect of the Thirty Years' War was to depopulate the rural districts of Germany, destroy its commerce, burden the people with taxes, cripple the already debilitated power of the emperors, and cut up the empire into a multitude of petty states, the rulers of which exercised almost absolute power within their own territories. Leopold I. (1658-1705), a haughty, pedantic man, did not avail himself of the opportunities afforded by peace for restoring order to the state, but suffered himself to be drawn into the coalition against France; while his hereditary states were overrun by the Turks, and were indebted for their safety to Sobieski, king of Poland. Although success often attended his arms, the cunning of Louis XIV. prevented peace from bringing the emperor any signal advantages; and it was in this reign that Strasburg was attached to the French empire. The reigns of Joseph I. (1705-11) and Charles VI. (1711-40), with whom expired the male line of the Hapsburg dynasty, were signalized by the great victories won by the imperialist general, Prince Eugene, in conjunction with Marlborough, over the French, in the war of the Spanish succession (1702-13). But the treaty of Utrecht (1713) brought no solid advantage to the empire. The disturbed condition of Spain and Saxony opened new channels for German interference abroad. Germany was further distracted, after the death of Charles, by the dissensions occasioned by the contested succession of his daughter, Maria-Theresa, who claimed the empire in virtue of the Pragmatic Sanction drawn up by her father in 1713, and through her of her husband, Francis I. of Lorraine, after their rival, the Bavarian Elector, Charles VII., had by means of Prussian aid been elected in 1742 to the imperial throne. Charles, however, was obliged to cede his crown after a brief occupation of three years. Constant disturbances, intensified during the Seven Years' War (1756-63), when Frederick the Great of Prussia maintained his character of a skillful general at the expense of the Austrians, made the reign of Francis I. (1745-65) one of trouble and disaster. Joseph II., his son (1765-90), during the lifetime of Maria-Theresa, who retained her authority over all the Austrian states, enjoyed little beyond the title of emperor, to which he had succeeded on his father's death. But when he ultimately acquired his mother's vast patrimony he at once entered upon a course of reforms, which were, however, premature, and unsuited to the cases to which they were applied; while his attempts to reestablish the supremacy of the imperial power in the south of Germany were frustrated by Prussian influence.

Leopold II., after a short reign of two years, was succeeded in 1792 by his son Francis II., who, after a series of defeats by the armies of the French Republic, and the adhesion, in 1805, of many of the German princes to the alliance of France, which led to the subsequent formation of the Rhenish Confederation under the protectorate of Napoleon, resigned the German crown, and assumed the title of Emperor of Austria. (See for further details AUSTRIA, NAPOLEON, FRANCE, PRUSSIA, and the articles on the other German states.) From this period till the Congress of Vienna of 1814-15 Germany was almost entirely at the mercy of Napoleon, who deposed the established sovereigns, and dismembered their states in favor of his partisans and dependents, while he crippled the trade of the country,

and exhausted its resources by the extortion of subsidies or contributions. The second peace of Paris (1814) restored to Germany all that had belonged to her in 1792; and, as a reconstruction of the old empire was no longer possible, those states which still maintained their sovereignty combined, in 1815, to form a German Confederation. Of the 300 states into which the empire had once been divided there now remained only thirty-nine, a number which was afterward reduced to thirty-five by the extinction of several petty dynasties. The diet was now reorganized, and appointed to hold its meetings at Frankfort-on-the-Main, after having been formally recognized by all the allied states as the legislative and executive organ of the Confederation; but it failed to satisfy the expectations of the nation, and soon became a mere political tool in the hands of the princes, who simply made its decrees subservient to their own efforts for the suppression of every progressive movement. The festival of the Wartburg, and the assassination of Kotzebue, were seized as additional excuses for reaction; and though the French revolution of 1830 so influenced some few of the German states as to compel their rulers to grant written constitutions to their subjects, the effect was transient, and it was not till 1848 that the German nation gave expression, by open insurrectionary movements, to the discontent and the sense of oppression which had long possessed the minds of the people. The princes endeavored by hasty concessions to arrest the progress of republican principles, and, fully recognizing the inefficiency of the diet, they gave their sanction to the convocation, by a provisional self-constituted assembly, of a national congress of representatives of the people. Archduke John of Austria was elected Vicar of the newly-organized national government; but he soon disappointed the hopes of the assembly by his evident attempts to frustrate all energetic action on the side of the parliament, while the speedy success of the anti-republican party in Austria and Prussia damped the hopes of the progressionists. The refusal of the king of Prussia to accept the imperial crown which the parliament offered him in 1849 was followed by the election of a provisional regency of the empire; but as nearly half the members had declined taking part in these proceedings, or in a previous measure, by which Austria had been excluded, by a single vote, from the German Confederation, the assembly soon lapsed into a state of anarchy and impotence, which terminated in its dissolution. The sanguinary manner in which insurrectionary movements had in the meanwhile been suppressed by Prussian troops both in Prussia and Saxony put an effectual end to republican demonstrations; and in 1850 Austria and Prussia, after exhibiting mutual jealousy and ill-will, which more than once seemed likely to end in war, combined to restore the diet, whose first acts were the intervention in Sleswick-Holstein in favor of Denmark, and the abolition of the free constitutions of several of the lesser states. From that period the diet became the arena in which Austria and Prussia strove to secure the supremacy and championship of Germany; every measure of public interest was made subservient to the views of one or other of these rival powers; and the Sleswick-Holstein difficulties were the principal questions under discussion in the federal parliament down to the rupture between Prussia and Austria, and the dissolution of the Bund in 1866.

The immediate occasion of the war of 1866 was the difference that arose between Prussia and Austria after the convention of Gastein (1865), as to the occupation and disposal of the territory taken from Denmark in the short war of 1864. But the real grounds lay in the rivalry between the states for the leadership of

Germany, the germ of which is as old as the time of the Great Elector, and which has shown itself at many epochs of their history. There can be little doubt that the feeling of the German people, as distinguished from the princes and bureaucracy, had, in recent times at least, been in favor of the purely German Prussia, as their leader, rather than Austria. And when the parliament of Frankfort, in 1849, offered the imperial crown to the king of Prussia, the unity of Germany might have been secured without bloodshed, had the monarch been less scrupulous, or had he had a Bismarck for his adviser. But that opportunity being let slip, and the incubus of the "Bund" being restored, it became apparent that the knot must be cut by the sword.

By the treaty of Gastein Austria and Prussia agreed to a joint occupation of the Elbe duchies; but to prevent collision it was judged prudent that Austria should occupy Holstein, and Prussia Sleswick. Already a difference of policy had begun to show itself; Prussia was believed to have the intention of annexing the duchies; while Austria began to favor the claims of Prince Frederick of Augustenburg. In the meantime, both nations were making ready for the struggle; and Italy, looking upon the quarrel as a precious opportunity to strike a blow for the liberation of Venetia had secretly entered into an alliance with Prussia.

In the sitting of the German diet, June 1, 1866, Austria, disregarding the convention of Gastein, placed the whole matter at the disposal of the Bund, and then proceeded to convoke the states of Holstein "to assist in the settlement of the future destination of the duchy." Prussia protested against this as an insult and a violation of treaty; demanded the reestablishment of the joint occupation; and, while inviting Austria to send troops into Sleswick, marched troops of her own into Holstein. Instead of responding to this invitation, Austria withdrew her forces altogether from Holstein, under protest; and then, calling attention to this "act of violence" on the part of Prussia, proposed that the diet should decree "federal execution" against the enemy of the empire. This eventful resolution was carried by a great majority on June 14, 1866; Hanover, Saxony, Hesse-Cassel and Hesse-Darmstadt voting for it. The resolution having passed, the Prussian plenipotentiary, in the name of his government, declared the German Confederation dissolved forever, and immediately withdrew.

Thereupon identical notes were sent by Prussia to the courts of Saxony, Hanover, and Hesse-Cassel. The terms were not accepted, and the Prussian troops at once took military possession of the three kingdoms without resistance. War was now declared against Austria; the Prussian host, numbering in all 225,400 men, with 774 guns, invaded Bohemia at three several points. The Austrians, who had been surprised in a state of ill-organized unreadiness, had assembled an army of 262,400 men and 716 guns; and the greater portion of these were stationed, under General Benedek, behind the Riesengebirge, expecting the attack from Silesia. The Prussian armies meanwhile crossed the Erzgebirge without opposition, drove the Austrian army steadily and quickly back with heavy losses, and, after effecting a junction, moved steadily forward to meet the Austrian army, now concentrated between Sadowa and Königgrätz. Here, on July 3d, was fought the decisive battle. The Austrian cavalry made heroic efforts to turn the tide of victory; but the stern trained valor of the Prussians, armed with the till then little known breech-loading "needle-gun," was invincible, and the Austrian army was broken and dissolved in precipitate flight. The Prussians lost upward of 9,000 killed and wounded; the Austrian loss was 16,235 killed and

wounded, and 22,684 prisoners. After this decisive defeat, which is known as the battle of Königgrätz or Sadowa, all hope of staying the advance of the Prussians with the army of Benedek was at an end; a truce was asked for, but refused; and not till the victorious Prussians had pushed forward toward Vienna, whither Benedek had drawn his beaten forces, was a truce obtained through the agency of the emperor of the French, the peace of Prague (August 20th). Italy, though more than half-inclined to stand out for the cession by Austria of the Trentino, as well as Venetia, reluctantly agreed to the armistice (August 12th).

A brief campaign sufficed for the defeat of the minor states of Germany that had joined Austria—viz., Bavaria, Württemberg, Baden and Hesse-Darmstadt; and, after peace had at last been arranged, some of them were forced to submit to a certain loss of territory. Saxony only escaped incorporation with Prussia through the resolute opposition of Austria supported by France; but the little kingdom, like all the other states that had taken arms against Prussia, was forced to pay a heavy war indemnity. Even the little principality of Reuss had to pay 100,000 thalers into the fund for Prussian invalids. The states north of the Main which had taken up arms against Prussia were completely incorporated—viz., Hanover, Hesse-Cassel, Nassau, Frankfurt and a small portion of Hesse-Darmstadt, as well as Sleswick-Holstein and Lauenburg; and the other states north of the Main were united with Prussia in a confederacy of a more intimate nature than before existed, called the North German Confederation.

Austria, by the treaty of Prague (August 20, 1866), was completely excluded from participation in the new organization of the German states, and formally agreed to the surrender of Venetia to Italy, to the incorporation of Sleswick-Holstein with Prussia, and to the new arrangements made by Prussia in Germany. A portion of the fifth article of this treaty secured that, if the "inhabitants of the northern districts of Sleswick declare, by a free vote, their desire to be united to Denmark, they shall be restored accordingly;" but this was withdrawn in 1873, by secret treaty between Austria and Germany. Though losing no territory to Prussia, Austria had to pay 40,000,000 of thalers for the expense of the war.

The North German Confederation, as thus constituted, possessed a common parliament, elected by universal suffrage, in which each state was represented according to its population. The first or constituent parliament met early in 1867, and adopted, with a few modifications, the constitution proposed by Count Bismark. The new elections then took place, and the first regular North German parliament met in September, 1867. According to this constitution, there was to be a common army and fleet, under the sole command of Prussia; a common diplomatic representation abroad, of necessity little else than Prussian; and to Prussia also was intrusted the management of the posts and telegraphs in the Confederation.

The southern German states which up to this point had not joined the Bund, were Bavaria, Baden, Württemberg, Hesse-Darmstadt, and Liechtenstein, with a joint area of 43,990 square miles, and a total population (1866) of 8,524,460. But, though these states were not formally members of the Bund, they were so practically, for they were bound to Prussia by treaties of alliance offensive and defensive, so that in the event of a war the king of Prussia would have at his disposal an armed force of upward of 1,100,000 men.

During the next few years the North German Confederation was employed in consolidating and strengthening itself, and in trying to induce the southern states

to join the league. The Zollverein was remodeled and extended, until by the year 1868 every part of Germany was a member of it, with the exception of the cities of Hamburg and Bremen, and a small part of Baden. This paved the way for the formal entrance of the southern states into the confederation; but they still hung back, though the ideal of a united Germany was gradually growing in force and favor.

In the spring of 1867 a war between Prussia and France seemed imminent, from difficulties arising out of the occupation of Luxemburg by the former; but by the good offices of the British Government, a congress of the great powers (Italy included) was assembled at London, at which an arrangement satisfactory to both nations was amicably agreed upon, Luxemburg remaining in the possession of the king of Holland. It was evident, however, that hostilities had only been postponed, and on both sides extensive military preparations were carried on.

In 1870 the long-threatened war between Prussia and France broke out. On July 4th of that year the provisional government of Spain elected Prince Leopold of Hohensollern, a relative of King William of Prussia, to fill their vacant throne. This step gave the greatest umbrage to the French Government; and though by the advice of William I. of Prussia, Prince Leopold resigned his candidature, it was not satisfied, but demanded an assurance that Prussia would at no future period sanction his claims. This assurance the king refused to give; and on July 19th, the emperor of the French proclaimed war against Prussia. Contrary to the expectation of France, the southern German states at once decided to support Prussia and the northern states, and placed their armies, which were eventually commanded by the Crown-prince of Prussia, at the disposal of King William.

By the end of July the forces of both countries were congregated on the frontier. Napoleon, however, lost a fortnight in delays after the declaration of war, and it was discovered that the French army was by no means in a state of satisfactory preparation, while the Germans were splendidly organized, and much superior in number. The result was that the French, instead of marching to Berlin as they anticipated, never crossed the Rhine, and had to fight at a disadvantage in Alsace and Lorraine.

On August 2d the French obtained some trifling success at Saarbrück, but the rapidly following battles of Weissenburg (August 4th) Wörth, and Spicheren (both August 6th) were important German victories. The German advance was hardly checked for a moment, though the losses on both sides were very heavy. The battle of Gravelotte, in which King William commanded in person, was fought on the 18th; and, though the Germans suffered immense loss, they were again victorious, and forced Bazaine to shut himself up in Metz. The Emperor Napoleon and Marshal MacMahon in vain attempted to proceed to the relief of Bazaine. They were surrounded at Sedan, and completely defeated with heavy loss. The emperor surrendered on September 2d, with his whole army, about 90,000 men, and was sent as a prisoner into Germany. By the 19th of September the Prussians had reached Paris, and commenced a vigorous siege. Strasburg capitulated on the 27th, after a severe bombardment, and on October 28th Bazaine surrendered Metz with an army of 6,000 officers and 173,000 men, 400 pieces of artillery, 100 mitrailleuses, and 53 eagles. Verdun capitulated on November 8th; Thionville followed on the 24th; after which there were several capitulations of lesser importance.

The French made extraordinary efforts to raise armies

and relieve Paris, but, with the exception of a momentary gleam of success on the Loire, they met with nothing but severe defeats. Of these may be mentioned the battle of December 3d in the forest of Orleans, and that of Le Mans, January 12th, in which contests Prince Frederick-Charles took all together 30,000 prisoners. After numerous unsuccessful sorties, and enduring great sufferings from famine, Paris surrendered on January 29th, and the war was virtually at an end. The French army of the east, 80,000 strong, under Bourbaki, was compelled to retire to Switzerland on the 31st. By the peace of Frankfort (May 10, 1871) France was condemned to pay a war indemnity of five milliards of francs, or \$1,000,000,000; and the province of Alsace, along with the German part of Lorraine, was ceded to Germany.

A very important result of the war was to complete the fusion of the northern and southern states of Germany. The southern states joined at once in the war against France; in November, 1870, Baden and Hesse leading the way, they all became members of the German Confederation; and next month the re-establishment of the German empire was almost unanimously resolved, with the king of Prussia as hereditary emperor. It was at Versailles, on January 18, 1871, that the king was proclaimed emperor of Germany.

The new German empire set vigorously to work to organize itself as a united federation, under the skillful leadership of Prince Bismarck, who was appointed Reichskanzler or Imperial Chancellor. Almost at once it found itself involved in the ecclesiastical contest with the Church of Rome, known as the "Kulturkampf," which had previously begun in Prussia. The origin of the struggle was an effort to vindicate the right of the state to interfere, somewhat intimately, with the behavior, appointments, and even educational affairs of all religious societies in the country. The Jesuits were expelled in 1872, and Pope Pius IX. retorted by declining to receive the German ambassador. The famous Falk or May Laws were passed in Prussia in 1873-4-5, and some of their provisions were extended to the empire. Several German prelates, refusing obedience, were expelled from Germany; and the disorganization in ecclesiastical affairs became so serious that the Reichstag passed a law in 1874 making marriage a civil rite. The pope issued an encyclical declaring the Falk laws invalid, and matters seemed for a time to be at a deadlock. On the election of a new pope, Leo XIII., in 1878, attempts were made to arrange a compromise between the empire and the papal see. Falk, the Prussian "Kultur"-minister, resigned in 1879, and certain modifications were made in the obnoxious laws in 1881 and 1883. Bismarck took a further step toward Canossa in 1885 when he proposed the pope as arbiter between Germany and Spain in the dispute as to the possession of the Caroline Islands; and he practically owned himself beaten in the concessions which he granted in revisions of the politico-ecclesiastical legislation in 1886 and 1887. Another semi-religious difficulty which demanded government interference was the social persecution of the Jews (*Judenhetze*), which reached a climax in 1880-81.

In more strictly political affairs the rapid spread of socialism excited the alarm of the government. Two attempts on the life of the emperor (in May and June, 1878) were attributed more or less directly to the Social Democrat Organization, and gave the signal for legislative measures conferring very extensive powers upon the administration to be used in suppressing the influence of socialism. These socialist laws, though limited in duration, have invariably been renewed (sometimes with added stringency) before their validity expired;

in 1889 several of the most important towns of the empire were in what is called "the minor state of siege" for police purposes, and a new permanent socialist law was proposed by government in October of that year. A plot, happily futile, to blow up the emperor and other German rulers at the inauguration of the National Monument in the Niederwald in 1883 was considered by government to justify its repressive measures. Prince Bismarck, however, was not content with repressive measures; he has endeavored by improving the condition of the working-classes to cut the ground from beneath the feet of the socialistic propagandists. The acknowledgment in the emperor's message to the Reichstag in 1881, that the working classes have a right to be considered by the state, was followed by laws compelling employers to insure their workmen in case of sickness or of accident, and by the introduction (1888) of compulsory insurance for workmen against death and old age—measures that have been by some called "state-socialism."

The energetic commercial policy of government also, which since 1879 has been strongly protectionist, has its springs in similar considerations; and the recent colonial policy, which began in 1884 with the acquisition of Angora Pequena, may be considered to be stimulated partly by desire to gratify the national self-respect, and partly to provide new outlets under the German flag for the surplus population, and new markets for the home manufactures. None of the German colonies as yet, however, either in Africa or the Pacific Ocean, have proved of any great commercial value. The assembling of the Congo Congress at Berlin in 1885 fitly marked Germany's admission to the list of colonial powers. On the maintenance and improvement of the army and navy the German government has bestowed the most unremitting care, urged especially by the attitude of the "Revanche" party in France, though hitherto the imperial policy has been entirely pacific.

Considerable parliamentary friction has been caused more than once by the unwillingness of the Reichstag to vote military supplies to the amount and in the manner demanded by the emperor and chancellor. The latter desire to have practically a free hand in military matters, while the national parliament seeks to exercise a constitutional control over the army resembling that illustrated in Great Britain by the annual Mutiny Act. A compromise was effected in 1874 in virtue of which the military strength was fixed and the supplies granted for the periods of seven years at a time. In 1886 the government proposed to terminate the current *Septennat* in 1887 instead of 1888, and to immediately add largely to the peace strength of the army. On the rejection of the bill the Reichstag was dissolved (January, 1887) by the emperor, and an appeal made to the country. The Iron Chancellor still possessed the confidence and the gratitude of the people, and the new elections in February, 1887, resulted in a crushing defeat for the opponents of the government, notably the Freisinnige and the Social Democrats. One of the most remarkable features of this election was a letter written by the pope in favor of the army bill, for which he subsequently received a *quid pro quo* in a further modification of the May laws. The Military Septennate Bill was immediately passed, and was followed in 1888 by a Military Organization Bill, which made several changes in the conditions of service in the *Landwehr*. The subsequent budgets show an enormous increase in the extraordinary military expenditure. While thus seeking peace by preparing for war, Germany has not failed to use diplomacy for the same end.

A personal meeting of the emperors of Germany, Austria, and Russia in 1872 was considered a proof of a

political alliance (*Dreikaiserbund*); and, when Russia drifted somewhat apart from Germany in 1878, an offensive and defensive alliance was formed between Austria and Germany in 1879. Italy afterward entered this Triple Alliance. Germany's influence on the Eastern question was recognized in 1878, when the plenipotentiaries of the powers met at the Congress of Berlin.

On March 9, 1888, the Emperor William I. died. His son Frederick, at that time suffering from a cancerous affection of the throat, immediately issued a proclamation, in which he promised to consider "new and unquestionable national needs," and it was understood and to some extent felt that a more liberal era had commenced. The new emperor, however, died on June 15th, and William II., his son, who succeeded, at once recurred to the policy of William I. and Prince Bismarck. Much painful excitement was caused by a medical dispute as to the nature and cause of the late emperor's fatal illness, which speedily developed into a party question, discussed on both sides with virulent acrimony. The latter part of 1888 and the year 1889 were devoted by the young emperor to visiting the courts of several of his fellow-sovereigns in Europe. Germany continued to extend her colonial empire, not, however, without coming to blows with the natives; and in Samoa became temporarily involved in hostilities with one of the chiefs. Difficulties on the east coast of Africa led, in 1888, to a blockade by the British and German fleets to prevent the importation of arms and to check the slave trade. This lasted until October, 1889.

German Language.—In its ordinary sense the name German Language or *Deutsche Sprache* is now generally used to denote, in all their stages from the earliest time to the present day, the different languages and dialects of Teutonic origin spoken in the German and Austrian empires and in Switzerland, not including, however, the Frisian language, which once was spoken, and still in a few remnants survives, on the shores and islands of the German Ocean, nor the dialects of the Danish population of northern Schleswig. Flemish and Dutch, although very closely connected with German, are likewise excluded. But even in the stricter sense the designation *Deutsch* is not of very long standing, nor has the word always been a real proper name for a distinct people or tribe. In Bishop Ulfila's Gothic version of the Bible we find the adverb *thiudisko*, which is clearly a derivative from *thiuda*, meaning primarily "after the manner of the people." German writers of the earlier centuries were therefore as fully justified in calling their own language *diutisc*, or, in a Latinized form, *theudiscus*, *theotiscus*, that is, their popular or vernacular language, as were those mediæval Latin writers of all nations who distinguished their national languages by the name of *lingua vulgaris* from Latin, the only literary language fully acknowledged in their time. It was not until the tenth century that another Latinized form frequently used in later times, viz: *teutonicus*, began to be used instead of the older *theotiscus*, of which the only rivals in former times had been such local names as *franciscus* (*frencisc*) or *saxonicus*, which were no doubt derived from the names of single tribes, but were often also used in the same comprehensive sense as *theotiscus*, without necessarily implying any allusion to dialectical differences between the languages of the tribes they properly belonged to. The last name we have to mention here is the Latin *Germanus*, with its different derivatives in the modern languages, including the English form *German*. Many attempts have been made to elucidate the origin of this word, but as yet nothing can be taken for certain beyond the fact that it is neither of Latin nor of German origin. Most prob-

ably it was a Celtic word, and, according to what Tacitus says in his *Germania* (ch. ii.), it was originally the name of a Celtic tribe, from which, by some strange error of the Roman and Greek historians, it has been transferred to the non-Celtic inhabitants of Germany. Accordingly the name has never been used by the Germans themselves except in imitation of its use in the works of Latin writers.

As to its geographical extension the German language has undergone very great changes in the course of the last two thousand years. At the dawn of history no Germans were to be found to the left of the Rhine, and even to the right of it Celtic tribes occur in the earliest times. There were Celts also in the south of the present Germany as far north at least as the Danube and the Main; Bohemia, too, derives its name from an early Celtic population, the Boii. Only the midland and north were inhabited by Germanic nations or tribes, stretching as far east as Poland, and perhaps covering even parts of the adjoining territories of Russia, where Slavonic and Finnish tribes were their neighbors. But of these Germanic tribes and their languages some have left no equivalents in our modern German tribes and dialects. We have mentioned the Frisian language as not belonging to German in its proper sense, although the Frisians have kept their original residence up to the present day, and have always been in constant connection and frequent intercourse with their "German" neighbors. Many other tribes have wandered from their seats and colonized other countries. It was as late as the middle of the fifth century that the Jutes, Angles and Saxons began their voyages of conquest to England, where they founded a new people and a new language, leaving their native soil open to Danish invasions. Much earlier the midland tribes had already been slowly pushing on to the west and south, and expelling or subduing and assimilating the Celtic owners of the territories they invaded. But what was gained in these parts was counterbalanced by great losses in the north and east. The territories about the lower and middle Elbe, Oder, and Vistula, abandoned by the Lombards, the Burgundians, the Goths, and some other Germanic tribes, as well as Bohemia, which for some short time had been in the possession of the German Marcomans, were soon filled up by the immigration of numerous tribes of the great Slavonic family. Without going into details of the facts which are well known to the student of history, we may simply state that, since about 500 A. D., when the great migration of the nations had come to an end so far as Germany was concerned, no further change of any great importance has taken place in the western and southern parts. In the east the German population at this time did not go beyond a line that may be drawn from about Kiel to the Böhmerwald, passing near Hamburg, Magdeburg, Naumburg, Coburg and Baireuth. As is well known, it is in later centuries that almost all the eastern districts have been recovered to German.

In the sixth century the remains of the numerous smaller Germanic tribes, mentioned before and during the migration of the nations, had consolidated into seven larger bodies or aggregations of tribes. The Frisians still held the extreme north of Holland and Germany. Their midland and eastern neighbors were then called by the new name of Saxons, borrowed from the Saxons who had left the Continent for England. In the main parts of the Netherlands and Belgium, along both sides of the Rhine, and across Germany to the Thuringian and Bohemian Forests, the powerful Frankish confederation had established itself, and it soon incorporated the smaller and less vigorous tribes of the Hessians and Thuringians, which were surrounded by the midland or eastern Franks, the Saxons, and the Slavs. Alsatia,

Switzerland, and South Germany eastward to the river Lech were occupied by the Alemannians, while the inhabitants of the remaining districts of the present Bavaria and Austria bore the collective name of Bavarians.

The history of the German language cannot be severed from the history of these tribes, for Frisian, Saxon, Frankish (Hessian, Thuringian), Alemannian, and Bavarian are the leading dialects of the Continental branch of the Teutonic family. Having no specimens of the languages of the Continental tribes for nearly three centuries after their final settlement, we cannot tell to what extent they originally agreed with or differed from each other, although there must have been some dialectical differences to begin with, which were afterward increased and multiplied, partly by phonetic changes (most probably resulting from scarcely discernible phonetic peculiarities, which, even in the earliest times, must have prevailed in those idioms), and partly by such alterations of the inflexional systems as are known to occur frequently in all languages whose character is not merely literary. But, however scanty our means of illustrating the earliest history of these idioms may be, there is no doubt that they were not all of them related to each other in the same degree. Three main groups are easily distinguishable—(1) Frisian and Saxon, whose nearest relation is English; (2) Frankish, Hessian, and Thuringian; and (3) Alemannian and Bavarian. Frisian is generally considered as a separate language. From Saxon the later Low German dialects have sprung. The members of the third group (generally designated as *Oberdeutsch*, or Upper German), combined with *Mitteldeutsch*, or the midland dialects, viz., Thuringian, Hessian, and part of the Frankish dialects, are the sources of the later *Hochdeutsch*, or High German. The greatest difference prevails between the first and third groups; the second may be characterized as containing various transition dialects. The southern Frankish dialects are very closely akin to the adjacent Upper German idioms, while Dutch, the utmost offshoot of the Frankish language to the north, does not very materially differ from Saxon or Frisian in the earliest period.

The German language presents, as do most of the cognate tongues, three main stages of development,—Old, Middle, and Modern,—distinguished by their inflexional and literary character. In accordance with Mr. Henry Sweet's description of the stages of the English language, Old German may be defined as the period of *full* inflections, while the Middle period is that of *levelled* inflections, but it is chiefly the literary character that distinguishes Modern High German from Low German and its own earlier stages. A special form of High German is established in this period for all literary purposes, supplanting the dialects both of Low and of High German that formerly were freely used in literary intercourse. Assuming two periods of *transition* besides, we have the following divisions, with the approximate dates:

Old High German	to 1050
Early Middle High German	1050 to 1150
Middle High German	1150 to 1350
Late Middle High German	1350 to 1500
Modern High German	1500 onward.

The same divisions have to be made for Low German, but the scheme cannot be so fully carried through, as the time between 1000 and 1200 is almost destitute of literary monuments.

Old German.—The inflexional characteristics of Old German are almost identical with those of Old English. Nouns had the same five cases,—nominative, accusative (only in a few instances kept distinct), genitive, dative, and instrumental. Strong and weak declensions of

nouns and their subdivisions, are likewise the same. The dual of the first and second personal pronouns is almost extinct in Old High German, but is quite common in Low German. In the verb we find the same distinction of the subjunctive from the indicative mood, and the same two inflected tenses, present and past,—the former also used for the future, the latter for all shades of past time. The order of the sentence corresponds generally to the modern use, but is not kept so strictly as now, especially in the oldest prose texts, which are often materially influenced by the Latin sources from which they have been derived or translated.

The earliest extant specimen of Low German belongs to the beginning of the ninth century. It is a short formula of renunciation of the devil to be used before the ceremony of baptism.

Much more numerous and various in age and dialect are the documents of Old High German, some of which date as far back as the eighth century. Welcome as they may be to the student of grammar, not much can be said for their intrinsic value. Almost all the prose pieces are mere translations (many of them could not be worse) from the Latin; and even such poetical works as Otfrid's *Life of Christ* are no more than prose thoughts forced into bad verse. Only a very few relics of true poetry have reached us, among which the *Hildebrandslied* (in a mixed dialect), the fragments of the *Muspilli* (a poem about the Last Judgment, in the Bavarian dialect, belonging, like the *Hildebrandslied*, to the beginning of the ninth century, and also written in alliterative verse), and the *Ludwigslied* (881 or 882, in one of the Frankish dialects) may be mentioned here.

The transition to Middle High and Low German is conspicuously marked by a decided improvement in the poetic faculties of the nation. While the tenth century has left only a very few specimens of poetry, and these of poor quality, the number of poems (mainly of a theological bearing) dating from the eleventh century is not inconsiderable, and the twelfth century shows a rapidity of literary development almost unparalleled. At first, indeed, religious and legendary poetry is still prevalent, but soon literature begins to take a more historical or epic turn. This tendency is clearly visible in the *Kaiserchronik*, or Emperor's Chronicle, in which the first attempt is made to give a survey of universal and German history in a poetical form. The romantic tales of Alexander the Great and of the battle of Roncesvalles were translated from the French—the *Alexanderlied*, by the Pfaffe Lamprecht, the *Rolandlied*, by the Pfaffe Konrad; while old national traditions contributed fitting subjects for such epic poems as that concerning the adventures of the Lombard King Rother. Lyric poetry, hitherto altogether neglected, sprang suddenly into vigor in the remote east of Austria about the middle of the century, and soon found its way to other countries. But the most decided advance was not made till about 1180, when the new forms of social life that had crept in among the more cultivated classes, in imitation of the laws and customs of French chivalry, began to exercise a powerful reforming influence on all branches of poetry. The example set by the Netherlands poet, Heinrich von Veldeke (who for some time lived, and partly wrote, in Germany), in his *Encit*, or *Æneid*, was soon followed by the three great epic masters of the period, Hartmann von Aue, Gottfried von Strasburg, and Wolfram von Eschenbach. About the same time the *Nibelungenlied* and other compositions of a more national character were composed, while lyric poetry was raised to a height of excellence never attained at any other period of the Middle Ages, and best represented in the songs of Walther von der Vogelweide. It was then for the first time that Germany possessed a

real literary language, undoubtedly homogeneous as far as style and meter are concerned. Whether a similar unity of the outer form of speech had already been reached at that period is a point very difficult to decide.

In the fourteenth and fifteenth centuries the development of the dialects rapidly advanced.

While the fifteenth century was marked by great divergences of the spoken dialects, important steps toward gaining a greater uniformity of literary speech were made in the same period by the invention of the art of printing, and by the development of certain *Kanzleisprachen*, or literary idioms of the imperial or other chanceries. There is no need to explain how the habit of reading books printed in dialects not familiar to the reader must have obliged the learned public of the time to acquire a certain amount of knowledge of dialects in general, and must have made them better aware of the peculiarities of their own idioms than was either necessary or possible at the time when manuscripts written expressly in the local dialects of the readers were the only means of conveying literary information. Besides, writers as well as printers must soon have found it profitable to publish their works in a language readily understood by readers in all parts of the country. The principal work, however, was done in Germany by the chanceries. Among these the imperial chancery naturally held the most prominent position; and, inasmuch as its public acts were addressed to readers of all dialects existing throughout the empire, it obviously had also the greatest interest in calling into existence a general idiom. In the fourteenth century no difference between the language of the imperial chancery and the local idioms of the particular emperors was yet visible. The public acts of Louis of Bavaria (1314-1347) were written in the Bavarian dialect. The succession of Charles IV. (1347-1378) was accompanied by the introduction of the Bohemian dialect into the imperial charters. This dialect, as was natural from its local position, was neither purely Southern nor purely Midland. *Ei, ou, eu* for *i, ü, iu* were frequently adopted from the Southern dialects, but *ch* for *k* and *p* for *b* were generally rejected; unaccented vowels were preserved to about the same extent as in Midland German. In the reign of Wenceslaus of Bohemia (1378-1400) the same state of things was maintained; but in the charters of Rupert, the elector palatine (1400-1410), we find the Midland dialect of the Palatinate. Sigismund (1410-1437) reintroduced the Bohemian dialect, which by this time had, with the exception of a very short period, prevailed for nearly a hundred years in the imperial chancery. It was therefore but natural that Duke Frederick of Austria should exchange the Austrian dialect of his ducal chancery (which abounded with *keh, kh, kg* for *k* and *p* for *b*) for the Bohemian chancery dialect of his predecessors, when he succeeded to the imperial throne (1470-1493). His example was followed by Maximilian (1493-1519), but only so far as public acts were concerned. In charters destined for local Austrian use as well as in his private correspondence he always kept his vernacular Austrian dialect, showing thus that no change of the spoken idioms had been caused as yet by the introduction of the new artificial language. In the same manner and at the same time the Midland dialect of the electoral chancery of Saxony came to be better adapted for general use by the adoption of the Southern *ei, ou, eu* for *i, ü, iu*, and the abolition of several prominent Midland peculiarities.

In the preceding paragraph we have tried to give a short sketch of the origin of literary Modern High German; and it is this very idiom of the imperial and Saxon chanceries that Luther made afterward popular by his translation of the Bible.

Luther's language, again, was soon acknowledged by German grammarians, as Sebastian Franck (1531) and Johannes Clajus (1578), and was accordingly imitated as the best pattern of High German. It is true that in the sixteenth century many writers, especially in Switzerland and Lower Germany, still clung with great pertinacity to their native dialects. But about 1600 Luther's language was fully established as the only idiom of literary intercourse throughout Germany. The changes the language has undergone since Luther's time mostly concern the inflexional system.

The varieties of the German dialects of the present are too numerous to be described here. It may suffice to state that the old divisions of Low German, Midland, and Upper German dialects are still applicable.

German Literature.—There is a deep vein of poetry in the Teutonic nature, and it appears to have revealed itself in the earliest ages. Unfortunately hardly a trace of the songs in which the old Germans, as Tacitus tells us, celebrated their gods and heroes, has come down to us. Of the rhythm in which these primitive conceptions were embodied, we have no certain knowledge, but as the most ancient poems which have been preserved are in alliterative verse, it is reasonable to assume that this had grown up long before writing had come into use.

When the German tribes began to accept Christianity the clergy everywhere opposed the native poetry. Among the Goths of the fourth century Bishop Ulfilas took the most effectual means of achieving his purpose by preparing a clear, faithful, and simple rendering of the Scriptures,—a translation which since proved of the highest value in the scientific study of the Teutonic languages.

Charles the Great was the first to check the hostile movement against pagan compositions. He showed his love of his native speech, not only by beginning to put together a German grammar, but by issuing orders for a collection of old German poetry. These treasures of old High and Low German literature are nearly all lost. Of the works with which the church sought to counteract pagan influences also very few remain, among them the *Heliand*, a Low German poem in alliterative verse. It is a narrative of the Life of Christ, said to have been written by a Saxon at the request of Louis the Pious. During the reign of Charles the Great and Louis the Pious secular learning was zealously cultivated in the monasteries, Fulda and St. Gall especially distinguishing themselves. From the time of Otto I. the German stood in direct relation with Italy; the marriage of Otto II. with the Princess Theophano brought them in connection with the learning and refinement of the Byzantine court; and Gerbert, the friend of Otto III., afterward Pope Sylvester II., introduced them to some of the achievements of Arabian science.

The reign of Henry IV., during which the struggle between the empire and the papacy began, had a disastrous effect on the national culture, and the evil was not remedied under the disturbed rule of his two immediate successors. But under the Hohenstaufen dynasty, during the period of Middle High German, the country passed through one of the greatest epochs of its literature. The more learned of the clergy interested themselves deeply in the development of scholasticism; and in the thirteenth century Albertus Magnus, a native of Swabia, produced the first systematic exposition of Aristotle, in the full light of Arabian research. It was, however, in poetry that Germany achieved the highest distinction, and her most important poets were members of the knightly class. The most characteristic outcome of this active era is the series of poetical romances produced in the twelfth and thirteenth centuries.

Heinrich von Veldeke is the first of the poets who may claim to rank as German *trouvère*. Hartmann von Aue, in *Der Arme Heinrich*, and other poems, selected themes that are rather repulsive to modern feelings, but he was endowed with plastic force, and interests us touching certain mystical aspects of mediæval sentiment. The master in whom these aspects were most fully represented was Wolfram von Eschenbach, whose chief poem, *Parzival*, was composed toward the end of the twelfth century. A complete, almost dramatic contrast to Wolfram, is found in Gottfried of Strasburg, the greatest of his literary contemporaries. Gottfried's theme is Tristram and Isolte; and the charming tale, which unfortunately he did not live to carry to an end, was perhaps never more beautifully told. The best known of Gottfried's imitators is Conrad von Würzburg, who wrote on the Trojan war and many other subjects. Toward the end of the thirteenth century the movement showed signs of exhaustion, and romances began to make way for rough popular tales and rhymed chronicles.

Fortunately the poets of the age of chivalry did not all occupy themselves with the subjects of French romances. A few, whose names have been forgotten, turned toward the rich material in the metrical legends of their native land. Of these poets the most important was he who collected and put into shape the *Nibelungenlied* (q. v.). The Germans justly regard this epic, which often has been compared to the *Iliad*, as one of the most precious gems of their literature. *Gudrun* is another epic in which a poet of this period gave form to several legends.

The age of chivalry was remarkable not only for its romances and epics, but for its lyrics. All the leading writers of the time exercised themselves in lyrical poetry, and it was laboriously cultivated by multitudes who did not feel equal to the task of a prolonged effort. Among those who gained more or less distinction may be named Heinrich von Morungen, Reinmar der Alte, and Gottfried von Neifen. The poets of this class were known as *Minnesänger*, because their favorite theme was Minne, or love. Of all the minnesänger the first place belongs without question to Walter von der Vogelweide. Besides the usual themes of the lyrical poetry of his time, he wrote with enthusiasm of his native land; he also frequently alludes to the strife between the spiritual and secular powers and sternly rebukes the ambition of the papacy.

Several of the *minnesänger*, Walter von der Vogelweide especially, display at times a strongly didactic tendency. From the beginning of the period this tendency was developed by writers who took little interest in poetry for its own sake, and it became more and more prominent as the purely lyrical impulse passed away. The didactic poet, however significant his labors may be to his contemporaries, has necessarily the stamp of commonplace for posterity; and the gnomic writers of the thirteenth century form no exception to this rule. Among the didactic writers of the period, Freidank stands foremost, who in his *Bescheidenheit* expresses so high a conception of duty, and expresses it so well, that the work was ascribed to Walter himself.

In this age also we find the first serious attempts to secure for German prose a place in the national literature. The *Sachsenspiegel* and the *Schwabenspiegel*, two great collections of local laws, mainly interesting because of their social importance, had considerable influence in encouraging the respect of the Germans for their own language. The preachers, however, were the principal founders of prose style. Brother Berthold, a Franciscan monk, a man of noble and commanding temper, and an orator of the highest rank, is the most prominent representative of those clergymen, who, dissatisfied with the

technicalities of scholasticism, strove to attain to a fresh vision of religious truth, and to kindle their own enthusiasm in the minds of others.

When, after the fall of the Hohenstaufen dynasty, the age of chivalry came virtually to an end, the muse of poetry found a refuge in the large cities, which, in the meanwhile, had risen to a position of higher importance than they had ever before occupied. Unfortunately the burghers had no literary training; they were not familiar with any great models; and the character of their daily employment was not such as to kindle thoughts that demand poetic utterance. They treated poetry almost like a trade, which had to be learned like any handicraft. Literature produced under such conditions could not have much vitality, and there is hardly a *meistersänger* whose name is worthy of being remembered.

Much more important than these tedious manufacturers of verse were the unknown authors of the earliest attempts at dramatic composition. The beginnings of the modern drama where the crude representations of scriptural subjects with which the clergy strove to replace certain pagan festivals. These representations gradually passed into the "Mysteries," or "Miracle Plays." Along with them grew up what were known as "Shrove Tuesday plays," dialogues setting forth some scene of noisy fun, such as a quarrel between a husband and wife, with a few wise saws interspersed. Hans Rosenblüt and Hans Folz, both Nuremberg *meistersänger*, were prolific writers of such plays.

By far the most important writers of the fourteenth century are the mystics, like Johannes Tauler, of Strasburg (1300-61), and Heinrich Suso, of Constance (1300-65). They are chiefly of importance in the history of speculative thought, but even from the point of view of literature, they were of high service in the development of a rich, vigorous prose.

During the latter part of the fifteenth century there was in Germany, as in other leading European nations, a great revival of intellectual life. And this was due to the same causes as prevailed elsewhere, especially the rediscovery of Greek literature and the invention of printing. It is surprising how many books found their way to the public between 1450 and the outbreak of the Reformation. Of this great mass of literature, a comparatively small proportion was created in obedience to the free impulses of the intellect. The problems of the time were mainly social and practical; men were less moved by ideal interests than by questions as to the tyranny of the princes, the greed and sensuality of the clergy, the worldliness of the papacy, the powerlessness of the crown to enforce peace and order. Multitudes of little tales in prose and verse appeared in which the princes, the nobles, the clergy, and sometimes rich citizens were held up to ridicule. By far the greatest of these satirical writings was the epic narrative *Reineke Vos*. The stories of *Reynard the Fox* and *Isengrim the Wolf*, probably belong to prehistoric ages. They became current, through the Franks, in Lorraine and France, and from the eleventh to the fifteenth century they formed the subject of many works in Latin, French and German. The epic to which allusion is now made appeared in 1498, and was probably by Hermann Barkhusen, a printer of Rostock. It is in low German, and its materials were obtained from a prose version of the tale which had appeared some years before in Holland, and of which Caxton printed an English translation. There are several renderings of the poem into high German, the most important being the well-known work of Goethe. Another popular satirical work was the *Narrenschiff* (Ship of Fools) of Sebastian Brandt, published in Basel in 1494. A satirist of bolder type was Thomas Murner, a preacher, who both in sermons

and secular writings attacked without mercy the classes who were the butts of his fellow-satirists. *Tyll Eulenspiegel*, a book published in 1519, deserves mention as it was once a great favorite, though the jokes it contains are mostly coarse and vulgar.

Behind the strife and noise of contending sections there was slowly growing up an admirable intellectual product of Germany—its popular poetry. One of the earliest writers who struck the note of the popular poets was Veit Weber, a Swiss who fought with his countrymen against Charles the Bold, and who celebrated in vigorous verses the battles of Grundson, Murten and Nancy. From this time the German people had always a living poet of their own, created by unknown authors, but caught up by the masses, passed on from village to village, till it was everywhere known, and handed down by each generation to its successor.

Luther (1483-1546), by his translation of the Bible, for the first time gave the nation a literary language. Up to this stage every author had written in the dialect with which he was himself familiar; henceforth for the men of Swabia, of Bavaria, of Saxony, and of all other districts there was a common speech, which the writers of each State could use without any sense of inferiority to those of another. It is thus to Luther, who also enriched the literature of the nation by some excellent hymns, that the Germans owe the most essential of all the conditions of a truly national life and literature. The writer who deserves to stand next to Luther is Ulrich von Hutten (1488-1523). An accomplished humanist, he effectually attacked the enemies of the new culture in the *Epistole Obscurorum Virorum*, of which he was one of the chief writers.

His German writings are mainly short satirical poems and prose dialogues and addresses. A far more voluminous author than Hutten or Luther was Hans Sachs, meistersinger of Nuremberg (1494-1567). He was, indeed, one of the most prolific German writers, having composed, according to his own calculation, more than 600 poems. Although extremely popular in his own time, Sachs was almost forgotten after his death. His memory was revived by Wieland and Goethe, and he is now universally admitted to have been the chief German poet of the sixteenth century. If Hans Sachs was the most industrious poet of the age, Johann Fischart was beyond all comparison, its greatest satirist. He was an enthusiast for the Reformation, and did it more lasting service among the middle class than half the theologians. His chief work was an adaptation of Rabelais' *Gargantua*, which he rendered with an insight into its purpose, and a fullness of sympathy with its methods, unsurpassed even by Urquhart. Among other cultivators of prose style deserving mention are Albert Durer, Johann Thurnmeier, called Aventinus (1466-1534), Sebastian Frank (1500-45) and Agidius Tschudi of Glarus (1505-72). The latter three wrote histories ranking considerable above mere chronicles. Huldreich Zwingli, the Swiss reformer (1484-1531) could state an argument with logical precision, but his style is thin and weak in comparison with the nervous force of Luther.

During the century the drama made considerable progress. Besides the *Mysteries* and *Shrove Tuesday Plays*, school comedies, in imitation of Plautus and Terence, were written and acted in the universities and public schools. Luther encouraged these comedies, and was, indeed, friendly to dramatic efforts of all kinds. When the Jesuits began to agitate in opposition to Protestantism they detected at once the importance of this element in popular life; and through their influence more attention was paid, not only to the plays, but to the manner in which they were represented. About the middle of the century a theater was built in Nuremberg

and Augsburg and other cities soon followed the example.

The period at which we have now arrived is, in many respects, the most dismal in German history. From 1618-1648 the country was desolated by the Thirty-Years' War, and such were the effects of this bloody struggle upon German literature that it almost vanished, and even the language itself became so corrupt and intermingled with foreign elements as to render it almost unfit for the expression of any elevated thoughts. Still there were some writers even in this dark period who accomplished some good work, especially in religious lyric. Paul Gerhardt (1606-75) wrote hymns that are admired in our own days. He had worthy associates among the Protestants in Johann Rist (1607-67), Joachim Neander (1610-88), and Louise Henrietta Brandenburg, wife of the Great Elector (1627-67). Some of the Jesuits also attempted the lyrical expression of religious feeling; and one of them, Friedrich von Spee (1592-1635), fell little short of the best among his Lutheran rivals.

The beginnings of modern German poetry are often dated from the publication of Martin Opitz's (1597-1639) critical book, *Die deutsche Poeterey*, which appeared in 1624, and enjoyed great popularity. In regard to merely outward form, it deserved its reputation, for Opitz was the first German writer who attempted sharply to distinguish the different species of poetry, to bring together some of the external laws which govern them, and to insist with emphasis that purity of style is essential to high literary effect. Opitz was born in Silesia, and from this circumstance the writers who shared his tendency or came under his influence are known as the first Silesian school. Paul Fleming (1609-40) was the principal lyrical, and Simon Dach (1605-59), a gifted sentimental poet of this school.

While the admirers of Opitz were striving to introduce a correct poetic style, a movement of a very different kind originated among the Pegnitzschäfer of Nuremberg. The members of this society, conscious of the barrenness of existing poetry, and not feeling in themselves the sources of higher activity, turned for help to Italian literature. Instead of studying the great Italian poets, however, they attached themselves to Marino and his extravagant school, and the chief result was a number of fantastic pastorals, the writers of which seemed to have no other aim than to show how much silly affectation the German language may be made to express. Their tendency was carried to its utmost development by the second Silesian school, at the head of which stood Hoffmannswaldau (1618-79) and Loenstein (1635-83). They in their turn were opposed by Canitz, the Berlin statesman and poet (1654-90), Besser (1654-1729), and König (1688-1744), most of whom were court poets, who endeavored to imitate the then fashionable verses of Boileau, but were unable to resist the success of Lohenstein's affected and extravagant effusions. One of the characteristic traits of the Germans' imitativeness was especially conspicuous during this period, and was the bane of literature in Germany, only a few, as Brookes of Hamburg (1680-1747) and Günther (1695-1723), were free from it, while Neukeirch (1665-1729) and especially Wernicke of Hamburg (died about 1720), were almost the only poets who dared to protest against it. The most entertaining book of the seventeenth century was a collection of tales of adventure, *Simplexissimus*, by Grimmelshausen, a style of composition in which he had been preceded by the satirist Moscherosch. The writings of the Roman Catholic preacher Abraham a Sancta Clara (1642-1709) are distinguished by a broad humor, especially his *Judas der Erschehn*, (Judas the Arch-Rogue), still his humorous

passages are marred by a far larger number in which he is pedantic or vulgar. No progress was made during the seventeenth century toward the formation of a national drama. For a time it almost seemed as if Germany could never hope to emerge from the intellectual degradation into which she had sunk, but in reality the higher forces of the nation were rallying in preparation for a new era. One of the first symptoms of revival was presented by the remarkable pietistic movement, which, although it ultimately led to the formation of the pettiest of petty sects, was in its origin noble both in aim and in method. Jacob Spener (1633-1705) and August Hermann Francke (1663-1727) were its originators, whose labors not only gave more sincerity to religious forms, but did service to literature by quickening the popular intellect, and awakening emotions which could find no satisfaction in the tedious writings of the day. Of still greater importance were the beginnings of modern German philosophy. It was in this dreary period that Germany gave birth to one of the most brilliant of her thinkers, Leibnitz (1646-1716). He was the first to lay a scientific basis for the study of philosophy in his native country, but his works he wrote chiefly in Latin or French, being disgusted with the prevailing style of the day. Wolf (1679-1754), his disciple, shaped the views of Leibnitz into a comprehensive system, and published his works in the German language. Christian Thomasius (1655-1728), an impressive popular thinker, edited the first German periodical, a sort of monthly magazine in which he vigorously attacked pedants and bigots. The seventeenth century closed with the foundation of the Berlin academy by Leibnitz.

The symptoms of a revival now became more and more numerous, and received a sudden impulse by the appearance of a great warrior and statesman in Germany. Frederick the Great profoundly affected the intellectual life, not only of Prussia, but of the whole empire. He restored to the people the faith in their own vigor; he convinced them that it depended on themselves whether or not they should rise to their ancient place in Europe; and by the prompt, faithful and energetic discharge of his personal duties he set before them an example which was widely felt. Literature shared the impulse which penetrated the national life. The general tendency was for reform in education, in literature, and soon for reform in all departments of thought. Gottsched in Leipsic (1700-1766), laboring in the same direction as Thomasius, exerted himself to make the German language the sole medium of instruction, and published in it manuals and abridgments of philosophy and science. He advocated the classical rules of composition of Racine and Corneille, but aimed above all at correctness. He, unfortunately for his fame, was a pedant of the worst kind; his views brought him into conflict with Bodmer (1698-1783) and Breitinger of Zürich (1701-76), who were admirers of Milton, and defended the claims of free poetic impulse against Gottsched's arbitrary laws of conscious art. They carried on a paper war in their respective journals, until at length many who had rallied round Gottsched became disgusted with his pedantry, and, separating themselves from him, established a periodical celebrated in German literature under the name of *Bremer Beiträge*, edited by Gärtner (1712-91) in which they opposed their former friend; at the same time they formed a poetical union to which Hagedorn was friendly, although he did not join it, but which was eventually joined by Klopstock, who became its most illustrious member. Among the contributors to this journal were Rabener (1714-71), a clever though somewhat tame satirist: Zachariä (1726-77), a writer of poetry in imitation of Pope's "Rape of the Lock;"

Gellert (1715-69), an amiable moralist and writer of fables and religious songs; Kästner, distinguished by his biting epigrams; Gieseke; Johann Elias Schlegel, dramatist, and Johann Adolph Schlegel (1721-93), poet; Fuchs, Cramer Ebert, translator of Young's *Night Thoughts*, and several others. The journal was printed in Bremen, but the poets resided for some time at Leipsic, whence they adopted the name of the second Saxon school, while the followers of Bodmer (of Zürich) style themselves the Swiss school. Related to the latter was the school of Halle, to which belonged Langé, Pyra, Uz, and Götz. The most distinguished of the poets of this school were Kleist (1715-59), the soldier-poet who was fatally wounded on the battle-field of Kunersdorf, author of descriptive and picturesque poetry in the manner of Thompson and Pope, and Ramler (1725-98), a composer of spirited odes, in Horatian meters, which like the *War Songs of a Grenadier* of Gleim (1719-1803) gave pleasure because of their strongly patriotic tone—the direct result of both cases of Frederick's influence. Gleim was one of the most kindly of men, and became the patron of young poets, who always found a willing and liberal helper in him. Anna Louisa Karsch (1722-91), a poetess who owed much to Gleim's goodness, was a favorite among the literary men of the day. Solomon Jessner of Zürich (1730-87) gained in his time a high reputation as a writer of idyls. He was imitated by Xaver Bronner, whose idyls have not half the merit of his autobiography, which affords remarkable insight into the religious life of Catholic Germany in the middle of the eighteenth century. Of greater influence than any of the poets yet named were Hagedorn of Hamburg (1708-54), whose fables and songs rendered him famous in Germany, and Albrecht von Haller (1708-77), the illustrious Swiss physiologist and savant, who was remarkable as a writer of descriptive and didactic poetry.

Important as were many of these writers, they exercised slight influence on the national mind compared with the three men whom the Germans justly regarded as the founders of their classical literature—Klopstock (1729-1803), Wieland (1733-1813), and Lessing (1729-1781). Klopstock stood in direct relation to the Swiss writers. When a pupil at Schulport, one of the great Saxon schools, which sent forth many of the best authors of the day, he was a diligent student of Bodmer, by whose critical principles he guided himself in reading Homer, Virgil and Milton. The *Messiah*, on which his fame mainly rests, is now little read. Notwithstanding its obvious defects, however, it has qualities which must still command admiration. Klopstock's odes, which he continued to write from the beginning to the end of his long career, are of higher excellence. Although Klopstock was one of the central literary figures during two generations, he was not a prolific writer; Wieland, on the other hand, was one of the most prolific of German authors. Of his many works the romantic poem *Oberon* is by far the most famous, and the only one that really pleases modern readers. He had a fine appreciation of style, and by the study of Greek and French masterpieces persistently strove to acquire lightness, clearness and ease. Even yet few German writers will compare with him in these qualities.

Whatever may be the excellences of Wieland and Klopstock, both are essentially writers of the past. This cannot be said of Lessing, the third great German of this period; he is still a living influence. He did for German literature what Luther did for the German language. He established a new school of criticism, and struck a final blow at Gallic influence, at the same time that Frederick the Great was coquetting with the French graces. His tragedy *Emilia Galotti*, his comedy *Minna von Barnhelm*, and his philosophical drama

Nathan der Weise, are models of dramatic composition. Valuable as were Lessing's imaginative creations, they were surpassed by his labors as a thinker. Here he was absolutely supreme among his contemporaries; and in some respects he has not since been surpassed. As a master of style he ranks with the greatest European writers. The greatest of Lessing's purely critical writings is *Laocöon*, a fragment, but a fragment containing the germs of much of the best thought of his own and the immediately succeeding generation. It has an enduring value as the first serious and great attempt to distinguish sharply the realms of art and poetry, and to foster both by subjecting each to its own laws. Next in importance stands his *Hamburgische Dramaturgie*, a series of profound and philosophical criticisms on plays represented at the Hamburg National Theater. In his later years he issued the *Wolfenbüttel Fragments*, portions of a theological work by Reimarius, a deistical writer of force and clearness. He thus became involved in a hot controversy with indignant professors and pastors, the noisiest of whom was Pastor Goetze of Hamburg. The tracts issued by Lessing in the course of this controversy are in form the most perfect of his writings; they are at once learned, keen and witty. In his *Education of the Human Race* he gave systematic shape to the fruitful principle that a religion which is not true absolutely or for all time may be of vast importance by meeting the needs of a portion of a race in special epochs, and that there is in history, notwithstanding apparent reactions, a progressive movement toward higher intellectual and moral ideals.

Thus, in all directions, the great writer labored for the intellectual regeneration of his people. If Goethe, Schiller and Kant found a nation prepared to receive their works they owed the fact to many causes, but among these the chief was the political activity of Frederick II., and the literary activity of Lessing.

Shortly after Lessing had begun to edit the *Literatur brieft*, a new influence was introduced into the literary world by Herder (1744-1803), who, while at Königsberg, became acquainted with Hamann and Kant, and who was known as a scholar as early as 1762. He brought to bear upon literature an almost universal knowledge, the study of the poets of all nations, an intimate acquaintance with Hebrew, Greek and Latin writings, and above all a cosmopolitan humanitarian spirit, which, together with his poetical genius, manifested itself most suggestively in the crowning work of his life, *Ideen zur Philosophie der Geschichte der Menschheit*. He contributed powerfully to promote the study of Oriental poetry, and was the first to call attention to the beauty of the ancient popular songs of different nations, and particularly of his own. Another great impulse was given by Winckelmann (1717-68). His examinations of the remains of ancient art and his writings modified all the old theories of the beautiful, and by his efforts the spirit of art and poetry was brought back to the genuine and simple taste of the Greeks. Heine, the accomplished critic and commentator, propounded the theories of Winckelmann at Göttingen, then the most brilliant university of Germany. The young men there became deeply impressed with the new theories, and under the influence of the reforms which were then initiated in religion, philosophy, literature, art and education founded in 1770 the *Musenalmannach*, a literary journal, and not long afterward a poetical union known as the *Göttinger Dichterbund* or the *Hainbund*. Klopstock became the leader and model of these enthusiastic youths, whose aim was to give a new stimulus to poetic emulation and to oppose to conventional theories a school of poetry founded upon the inspiration of genius and humanity. Among the members of the union were Bürger (1748-

94), the author of *Lenore* and other ballads and songs; Voss (1751-1826), one of the most learned philologists of his days, immortalized by his translations of Homer and Virgil; Hölty (1748-1776), whose songs became very popular; the two Stolbergs, who cooperated with Voss in familiarizing the Germans with the ancients, and who excelled in various kinds of metrical composition; Claudius, Miller, Hahn, Cramer, Gotter and Boje. A genial poet of this period was Pfeffel (1736-1809), whom it would be difficult to class with any particular school.

Goethe (1749-1832), already known to fame, came forward in 1773 with *Gotz von Berlichingen*, which created an entirely new period in dramatic literature. In 1774 appeared *Werther's Leiden*. The reformatory period of literature was now over. The revolution set in, or the *Sturm-und-Drangperiode*, as it was called after a drama of that name by Klinger (1753-1831), whose high-wrought tragedies and novels, as well as the writings of Schubart (1739-91) reflect most forcibly the excitement of this epoch. In the meanwhile Schiller (1759-1805) produced his *Räuber*, followed by *Fiesco* and *Cabale and Liebe*. These impassioned tragedies gave a new impetus to literary excitement. His *Don Carlos*, however (1784), shows greater moderation, and opens a long series of tragedies in which the highest aspirations for liberty and humanity are interwoven with historical associations, expressed in language of the most classical purity. But it was only after Schiller's union with Goethe (1795), that by their combined efforts German literature was brought to that classical perfection which, from a purely national, has since given it a universal influence. Schiller, by his enthusiastic and sympathetic eloquence and tenderness, became the favorite of the people; and Goethe, with his all-embracing intellect and boundless sensibilities, controlled by a strong will, incased in a body of exuberant health, and disciplined by lofty culture and knowledge, became the acknowledged sovereign of German literature.

While Goethe and Schiller were in the midst of their career, Europe was startled by the French revolution. At first it stirred as much interest in Germany as in England. The aged Klopstock welcomed it with odes full of the fiery energy of youth, and for a time Schiller almost fancied that his loftiest hopes were about to be realized. But the ensuing Reign of Terror soon transformed sympathy into bitter opposition; and when Germany was trodden under foot by Napoleon, she turned more and more from every kind of French influence.

An event of the highest importance in the intellectual growth of Germany was the publication, in 1781, of Kant's *Kritik der Reinen Vernunft*. Its effect on philosophy was not unlike that caused in our own days in science by Mr. Darwin's *Origin of Species*. Schiller became one of Kant's most enthusiastic students, and traces of the new system are to be found in many of his later lyrics and dramas. By-and-by, dissatisfied with the gulf left by Kant between mind and matter, as "things in themselves," philosophers started in search of some principle which should harmonize all the elements of existence; and thus grew up, one after the other, the systems of Fichte, Schelling, and Hegel. Philosophical writers of great eminence also were Herder, Moses Mendelssohn, and Hamann. In a popular style wrote Engel, the author of *Lorenz Stark*, and the psychological novels of Jacobi are among the more suggestive of German prose writings. Among other prose writers are Reinhold and Barth, Alexander Gottlieb, Baumgarter, Meier, and Sulzer. Abbt, Garve, Liscow, the philosopher and elegant fabulist; Lavater, the physiognomist; his friend Zimmermann, and his sarcastic opponent Lichtenberg; the historians Duhm, Möser,

Schröckh, Schlözer, and Beck; Spittler, the noted Göttingen historian; Moshinn, the ecclesiastical historian; Johannes von Müller, the historian of Switzerland, one of the classical historiographers of Germany (1752-1809); Georg Forster, the teacher and friend of Alexander von Humboldt, an admirable writer; the publicist Friedrich Karl von Moser; the educator Basedow, and afterward Pestalozzi; Campe, the writer of books for children; Nicolai, Lessing's friend and author of the satirical novel *Sebaldis Nothanker*; Adelung, the philologist; Bottiger, the antiquary; Sturz, the biographer; Reimarus, Jerusalem, Spalding, Rosenmüller, and Ernesti, in theology; Eichhorn in theology, in universal and literary history; Blumenbach, Bloch, Herschel, Euler, Vega, and many other eminent writers in various branches of learning and science, belong to this period. A writer who stood quite alone in his idiosyncrasies was Jean Paul Richter, usually called Jean Paul (1763-1825). It is difficult to do justice to Jean Paul, for he commits almost every fault of which a writer of romance can be guilty, yet it is impossible even to look into any of his innumerable books without recognizing his genius. The work which has maintained the strongest hold over the nation is perhaps his charming prose idyl, *Die Fliegelsöhne*, but his great romance, *Titan*, and the less ambitious *Stebenküß* have also kept their place as works of permanent excellence.

The most important literary movement which originated during the lifetime of Goethe was that of the Romantic school, whose aim was to assert for modern feeling the right of a freer, more varied utterance than can be provided for it by the forms of classical literature. The Romanticist delighted in drawing pictures of the middle ages, of the charms of chivalry, and of oriental life. The chief writers whom they opposed to the classical poets, both of antiquity and of modern times, were Shakespeare and Calderon, but they brought to light many mediæval authors who had previously been neglected, and stimulated the Germans to a systematic study of the whole of their past literature. The writer known as the prophet of the Romantic school was Friedrich von Hardenberg, generally called Novalis (1772-1801), while its critical leaders were the brothers August Wilhelm von Schlegel (1767-1845), and Friedrich von Schlegel (1772-1829), the former distinguished for his masterly translation of Shakespeare, the latter for his *Ancient and Modern Literature*. The period in which the brothers worked most effectually for their school was between 1796 and 1800, when they lived in Jena, and formed the center of a brilliant circle, which included Fichte, Schilling, Tieck and Wilhelm von Humboldt. Here they edited the *Athenæum*, in which they chastised feeble and pretentious writers and awoke general interest in mediæval art and literature, and in the systems of philosophy that harmonized with their special tendency. The most productive, and, for a time, the most famous writer of the Romantic school was Ludwig Tieck (1773-1853). A writer of less importance, but who exercised considerable influence over Tieck at an early period of his career, was H. R. Wackenroder (1772-98). He was the first to enlist the sympathies of the German artists for the æsthetic principles of the Romantic school. La Motte Fonqué (1777-1843) achieved, in his little book, *Undine*, a masterpiece. This charming tale, with its sweetness, pathos and dreamlike beauty, is now above criticism; it has taken its place as one of the select class of creations which appeal to all the world, and do not depend for their popularity on the tendencies of a particular time. Other Romanticists who deserve mention are E. T. A. Hoffmann (1776-1822), Clemens Brentano (1777-1842), Achim von Arnim (1781-1831), Joseph von Eichendorff (1788-1857), whose lyrics combine the depth

of emotion of the popular song with clear and musical expression, is an adherent of the Romantic school only in some of his tales. Adalbert von Chamisso (1781-1838), although usually classed as to some extent a Romanticist, has none of the dreaminess and mysticism of the school. The most distinguished dramatist of the school is Heinrich von Kleist (1776-1811). Allied to the Romantic school, although not directly connected with it, were the writers of the so-called fate tragedies. The originator of this curious class of works was Werner (1768-1823), and he found followers in Müllner and Hoiwald. The fate tragedy stuck for a time to the popular fancy, although it would be difficult to imagine a more trivial conception of fate than that which is developed in Werner's *Twenty-fourth of February*. Even Kotzebue, who, together with Iffland (1759-1814), had been for many years in possession of the stage, came under its influence. Kotzebue (1761-1819) was a most prolific writer; and, although he had no imagination, and wrote merely to catch the applause of the moment, his comedies still deserve to be named among the few works of this class which have hitherto been produced in Germany.

Among favorite novelists of the period are J. T. Hermes (1738); Hippel (1741-96); Musäus (1735-87), the author of a collection of *Volksmärchen*, or popular fairy tales; Blumauer, J. G. Müller, and Thümmel, (1738-1817), the author of a novel in imitation of Sterne's *Sentimental Journey*; Jung-Stilling (1740-1817), the inspired tailor, in whose naïve and original autobiography Goethe, Schiller and Herder took so much interest; Knigge (1752-96), the author of the *Reisenach Braunschweig*; and Immermann (1796-1840), the author of the famous story of *Münchhausen*.

The love of the Romantic writers for previous epochs of German history and literature led to the great researches of the brothers Grimm, who founded the scientific study of the German language and of German antiquities. They were followed by many devoted scholars, among whom may be named Beneke, Lachmann, Moritz Haupt and Franz Pfeiffer. The oriental studies of the Romanticists also promoted comparative philology, which acquired something of the character it now bears through the labors of the illustrious scholars, Wilhelm von Humboldt and Franz Bopp. During the calamitous period when Germany was humbled by Napoleon the Romantic school, by continually recalling the past glories of the nation, contributed largely to the revival of patriotic feeling. In the war of liberation the popular excitement was expressed with great spirit by the young soldier poet Theodor Körner (1791-1813), and the patriot Ernst Moritz Arndt (1769-1860). It was as a writer of patriotic war songs that Friedrich Rückert (1789-1866) opened his career. Afterward he moved over a wide range, distinguishing himself especially as a translator of Oriental poetry, where he showed an unsurpassed mastery over the language.

With Ludwig Uhland (1787-1862) the so-called Swabian school of poets came into existence. Uhland ranks with the greatest of modern lyrical writers. He is truly popular and patriotic in tone, yet his songs and ballads have an ease and grace of style which raise him far above the romantic school. Other Swabian poets were Justinus Kerner and Edward Märke. The theater was dominated by Raupach (1784-1852) and Freiherr von Auffenberg (1798-1857). One of the best of imitators of Walter Scott, whose influence at his time began to be felt in Germany, was Wilhelm Hauff (1802-1827); Wilhelm Häring, known as Willibald Alexis (1798-1876), also was influenced by the

great Scotch novelist. Johanna Schopenhauer, mother of the philosopher, was considered in her day an attractive writer of romance. She was surpassed by Caroline Pichler (1769-1843), who wrote several well-known historical novels.

With the death of Goethe in 1832 began a new era in German literature, an era not yet closed. In 1848 the national aspiration for freedom and unity found decisive expression in action; since that time Germany has achieved unity by the sword, while she still slowly feels her way toward freedom. It was inevitable that in such an epoch much of the best energy of the nation should be devoted to politics, but there has also been deep literary activity.

From 1818 till his death in 1831, Hegel dominated the highest thought. Among his followers who distinguished themselves are Arnold Ruge, who applied Hegelianism to politics; David Friedrich Strauss, who in his memorable *Leben Jesu*, resolved the narratives of the gospels into a series of myths; Feuerbach, who, going still farther, warred against all religion, and argued that it should be replaced by a sentiment of humanity. Schelling, Herbart, Lotze, Krause, Ubrice, and the younger Fichte also claim our notice as philosophers of the different Hegelian schools; none of the names, however, have the importance which attaches to that of Arthur Schopenhauer, who, although his chief book was written in the lifetime of Goethe, did not secure a hearing till long afterward. At the present time he stirs deeper interest than any other thinker. Eduard von Hartmann, the latest original thinker of Germany, works on essentially the same lines, but seeks to reconcile Schopenhauer not only with Hegel and Schelling, but with Leibnitz.

The growth of science has been one of the most powerful factors in the recent development of Germany. Among books presented in a popular form the result of scientific labor, Alexander von Humboldt's *Cosmos* still holds the first place. Liebig, Virchow, Helmholtz, Buchner, Vogt, also made admirable attempts to render subjects intelligible and interesting to ordinary readers. Of historians Leopold von Ranke, Gervinus, Droysen, Dahlmann, Häusser, Waite, Mommsen, Curtius, and Sybel are the most eminent. Of late years much attention has been devoted to *Culturgeschichte*, which describes the life of a people in all its phases, either through the whole part or during a particular epoch. A favorable example of works of this class is Karl Biedermann's *Germany in the eighteenth century*. Since the time of Lessing esthetics have always formed a prominent branch of philosophy among the Germans, and they have hardly been less successful as historians of art than as historians of metaphysics. High distinction has been achieved, among other art historians, by Kugler, Vischer, Carrière, and Lübke. Of historians of literature there is almost a small army, and not less vast is the amount of biographical literature. No German writer since Goethe and Schiller has excited so much interest throughout Europe, as Heinrich Heine. He professed to care little for what men said of his poetry, yet it is mainly as a lyrical poet that his name lives. His *Buch der Lieder* is one of the most fascinating collections of lyrics in European literature. In his prose, which deals with a wide range of subjects, he is rather French than German in his love of sparkling epigram and wit. The combination of pathos, wit and humor in his writings gives him a unique place in the literature of his country.

Platen, who belongs rather to the previous period, was one of the many writers whom Heine bitterly attacked, but he was a poet of considerable power, and of a lofty, manly character. His odes and sonnets are

in a language and meter so artistically finished as to rank among the best classical poems of modern times. Börne was another writer whose fame suffered from Heine's satire. He was a manly literary critic, and, as a political writer, dealt at the despotic government of Germany blows they keenly felt.

A school of writers known as "Young Germany," was deeply influenced by Heine, and had the good fortune to be singled out for persecution by the confederate diet. Their object was to effect a complete revolution in the political and social institutions of Germany, and at the same time they became the propagandists of ideas intended to undermine the church. The most important member of the school was Karl Gutzkow, who wrote a number of dramas which maintain their hold on the stage. He was also the author of many romances, of which the chief were *Die Ritter vom Geste* (The Knights of the Mind), and *Der Zauberer von Rom* (The Magician of Rome). Heinrich Laube, Gustav Kühne, Theodore Mundt, and Ludolf Wienborg belonged to the same school.

The novel has acquired the same important place in Germany as in France and England. One of the most distinguished of recent novelists is Gustav Freytag, whose chief work, *Soll und Haben* (Debit and Credit), is a study of Commercial life, intensely realistic in tendency. Important historical romances have been written by Levin Schücking, who is remarkable for his power of vividly conceiving character. The countess Ida Hahn-Hahn, is the writer of a number of novels; she is surpassed by Fanny Lewald, one of the best German novelists. Among other female authors that reached high distinction in most recent times are Eugenie John, best known as E. Marlitt, and Elizabeth Bürstenbender, who writes under the *nom de plume* of Victor Werner. Paul Heyse's short tales have firmness of outline and are at the same time full of delicate grace; as a writer of elaborate romance, he also achieved success. The humor of Hackländer is generally considered to surpass that of any recent writer; and among the novelists of simple village life Auerbach takes the first place, Friedrich Spielhagen has penetrated deeply into the spirit of the age, and in *Problematische Naturen* (Problematic Natures), and other works, reveals its tendencies with cultivated imaginative force. The novels of Fritz Reuter, although written in Low German, take high rank.

Contemporary literature has not been divorced from the stage. Besides Gutzkow and Laube, Gottschall has been a fertile writer, both of tragedy and comedy; Freytag, also Prutz, are original dramatic authors. Other dramatists are Grabbe, Hebbel, Friedrich Halm, Mosenthal, Paul Lindau, Adolf Wilbrandt, Charlotte Birch-Pfeiffer, and Roderich Benedix.

Many recent writers have attempted lyrical and narrative poetry, some of them with sufficient power to maintain worthily the traditions of German literature. From about 1830 onward a group of Austrian poets commanded the respect of all Germans. The chief was Count von Auersperg, better known as Anastasius Grün. The Hungarian Nicholas von Strehlbaum, generally called Lenau, gives powerful utterance in several poems to the sorrows of a deeply melancholy nature. Meisener and Hartmann, Bohemian poets, have a considerable reputation. Leopold Schefer's *Laienbrevier*, is interesting because of the contrast it presents to the pessimist tone of more recent writers. Before the revolutionary movements of 1848 a number of writers attempted to force poetry into the service of freedom. Of these one of the best known is Herwegh. The interest of his writings is rather historical than literary. Ferdinand Freiligrath was of

a more truly poetic temperament. His poems have graphic force, and in his earlier writings he displayed a remarkable talent for reproducing the gorgeous colors of tropical landscape. Hoffmann von Fallersleben and Franz Dingelstedt also deserve mention here. The lyrics of Emmanuel Geibel have found favor with nearly all classes. Among the most distinguished contemporary writers is Robert Hamerling, whose poetry is remarkable for the boldness of its conceptions and its almost vehement passion. Since the middle of the eighteenth century Germany has never been without writers of deep thought and vast research, and in her supreme writers—in Lessing, Goethe, Schiller, and Heine—these qualities have been associated with a feeling for artistic finish which has not been surpassed in England, or even in France.

GERMERSHEIM, a fortified town in Rhenish Bavaria, the chief town of a circle, is situated at the confluence of the Queich and the Rhine.

Germersheim existed as a Roman stronghold under the name of Vicus Julius. The citadel was rebuilt by the Emperor Conrad II., but the town itself was founded in 1276 by the Emperor Rudolph I., who granted it the rights of a free imperial city. He died in Germersheim in 1291.

GERMS, a name applied to the egg-cell of plant or animal, either from the first or in its early stages; but also used in reference to micro-organisms associated with disease, (see BACTERIA, etc.) By "germ-cells" the reproductive elements, especially the ova, are meant; while "germ-plasma" is a very common modern word for the most essential parts of the nuclei in the reproductive cells.

GERM THEORY OF DISEASE, as the name implies, seeks to find the explanation of certain well-recognized conditions of disease in the presence and action of specific living organisms within the affected body. Though comparatively recently introduced as an efficient working hypothesis in the investigation of some hitherto ill-understood pathological phenomena, the correctness of the theory is now generally admitted. The facts which it has aided in establishing and the numberless investigations which it has inspired have created an important department of medical science. The study of bacteriology (see BACTERIA) has awakened fresh interest in almost every branch of medicine; and the subject possesses a large and extensive literature of its own.

The evolution of the theory was due mainly to two factors: (1) The discussions and investigations which circled round the process of fermentation; (2) the application of more perfect microscopical methods to the study of the lowest forms of plant and animal life.

(1) The familiar process of FERMENTATION (*q.v.*) gave birth to much debate. The earlier chemists (Gay-Lussac, and more recently Liebig) held that fermentation was merely the result of the process of decay of organic matter. Various modifications of this doctrine, which cannot be considered here, were enunciated, but the general conclusion remained the same. On the other hand, so early as 1812, Appert had demonstrated from the practical side that organic substances capable of fermentation or putrefaction could be preserved intact if kept in closely stoppered bottles which were afterward exposed to the temperature of boiling water. In 1836 Caignard-Latour described an organism, the yeast plant, which he affirmed to be constantly present in the fermenting fluid. Its growth and reproduction he believed to proceed synchronously with the fermentation. Schwann (1837) described this organism independently, and Helmholtz (1843) confirmed the observation. They maintained that the process, in place of being a mere decomposition, was vital and depended on the presence

of the organism they had discovered. This revolutionary doctrine was further elaborated preëminently by Pasteur and by Schultz, Schroeder, Dusch, Lister, Tyndall, and others. Their researches showed that fermentation was caused by the presence of these organisms; that the exclusion of these from fluids capable of fermentation by various methods of sterilization and filtration of the air in which they were abundantly present, was sufficient to prevent its occurrence; that the doctrine which attributed the production of fermentation to the influence of certain gases—*e.g.*, oxygen (Gay-Lussac)—was erroneous; that the idea of the spontaneous generation of such organisms within properly sterilized and protected fluids (Needham, Bastian, Pouchet, Huizinga) was fallacious; and that the so-called putrefaction was but one variety of fermentation.

(2) One result of these discussions was to develop a refinement of the methods of microscopical research, more especially with reference to the investigation of the lowest forms of life. Though bacteria had been recognized and described in the seventeenth century (Leeuwenhoek), it is mainly to the researches of the latter half of the nineteenth century that we are indebted for an approach to an accurate knowledge of the life-history of these organisms. By the masterly labors of Cohn, De Bary, Zopf, Van Tieghem, Nägeli, Klebs, Koch, and many others, the methods of demonstration have been improved to an extraordinary degree. The elaboration of staining methods alone, in conjunction with the use of perfected lenses, has made possible the detection and examination of minute organisms which have hitherto been unrecognized.

It is impossible to say when the idea of an analogy between the familiar phenomena of fermentation and those of acute disease first arose. It is certain that before the nineteenth century there had been prevalent an ill-defined feeling after something of the kind. More than 200 years ago Robert Boyle (1627-91), in his *Essay on the Pathological Part of Physik*, clothes the idea in words which, as Tyndall has said, "have in them the forecast of prophecy." The idea received more definite formulation in consequence of the researches into the nature of fermentation referred to. In 1848 Fuchs stated that he had discovered bacteria in animals which had died of septicaemia. In 1850 it was announced (Davaine, Branell, Pollender) that bacilli had been detected in the carcasses of animals affected with anthrax. The discovery was corroborated by various observers. But it was not till the disease had been induced by the inoculation of healthy animals with a minimal quantity of the organism (Davaine) that the *Bacillus anthracis* was recognized as the cause of the disease. Thus was afforded the first substantial proof of the germ theory. This success inspired further research on kindred lines. In comparatively quick succession other discoveries were announced, till, in 1882, Koch described the *Bacillus tuberculosis* as the organism responsible for the scourge of consumption, and in 1883 the bacillus of cholera.

Emphasis must be laid on the statement that the discovery of an organism in the circulation or tissues of a diseased animal cannot be accepted as proving the causal efficacy of the former. Apart from further experiment, it were perfectly fair to argue that such organism was a mere accompaniment of the morbid state, flourishing on the dying or diseased tissues. And, in fact, such secondary factors are recognized. It has, moreover, frequently happened that competing claims have been advanced in explanation of the same disease. It was necessary, therefore, that there should be formulated (Klebs, Koch) certain conditions, since known as Koch's postulates, which must be fulfilled by an organism whose causal relationship with a given disease is main-

tained. These are as follows: (1) The organism must be demonstrated in the circulation or tissues of the diseased animal; (2) the organism, so demonstrated, must be capable of artificial cultivation in suitable media outside the body, and successive generations of *pure cultivation* obtained; (3) such pure cultivation must, when introduced into a healthy and susceptible animal, produce the given disease; (4) the organism must again be found in the circulation or tissues of the inoculated animal. The claims of organisms which fail to meet these demands must be set aside to await further proof.

The number of diseases whose specific origin is now generally admitted is comparatively large, but of few of these can we speak with the same certainty as may be done regarding consumption (tuberculosis) and splenic fever (anthrax). In other words, the fulfillment of all four postulates by many of them has not been demonstrated or has been disputed. Besides anthrax and tuberculosis, the list includes leprosy, cholera (Asiatic), relapsing fever, typhoid fever, yellow fever, malaria, diphtheria, dysentery, syphilis, acute pneumonia, gonorrhea, septicæmia, erysipelas, actinomycosis, etc. With considerable probability we may add whooping-cough, measles, scarlatina, typhus, smallpox, hydrophobia, tetanus, British cholera, etc.; but the evidence regarding these and others is defective, and, in some cases, less substantive than analogical.

The specific organisms associated more or less exactly with those diseases are members of the groups (a) *Coccaceæ* and (b) *Bacteriaceæ*.

The admission that certain diseases are due to the presence and action of specific living organisms raises the further questions: (1) How do they enter the body? (2) How do they act?

(1) How do they enter the body? It has been conclusively shown that the *Bacillus tuberculosis* may obtain access by the inhalation of germ-laden air, by the ingestion of affected milk and possibly of tubercular meat, perhaps, too, through a cut or sore. It seems also likely that the bacilli may be transmitted from mother to foetus by way of the circulation. Similar lines of attack may be predicated of all the pathogenic organisms. Notably, in connection with wounds, it is important to bear in mind the possibility of infection with the germs which induce septicæmia—a fact on which was based the great advance in surgery associated with the name of Lister.

The possibility of infection varies much according to the conditions of growth of the particular organism and the receptivity of the host. This explains, on the one hand, the popularly accepted view that certain diseases are much more infective than others. Thus, typhoid fever differs widely from scarlatina in respect of degree of contagiousness.

On the other hand, some persons undoubtedly are more susceptible to the attacks of certain organisms. Thus, among the subjects of tuberculosis, it is probable that preparedness of soil plays an important part in the production of the disease. And so with other pathogenic organisms. These processes have their analogy in the more common phenomena of vegetable life. Sow some seeds and they will germinate and grow on any soil, however unlikely. Other seeds may be scattered profusely, but will not develop, unless the soil has been carefully prepared and the other conditions of growth be fulfilled. It is impossible to enter here on the discussion of those conditions. Necessarily they vary much with different organisms. But it is important to realize the extreme value, from the therapeutic point of view, of their careful study. The first step to a rational treatment of such diseases is to *know* the responsible organism. This knowledge must include not

only its shape and other physical characters, but the life-history of the microbe, and the conditions which assist or retard its development and reproduction. Such knowledge affords the only sound basis for a system of *preventive medicine*, which constitutes one of the most important departments of practical hygiene. Although still in its infancy, the preventive treatment of endemic, epidemic, and other contagious diseases has now become scientific.

(2) How do the organisms act? This is a much-debated question. It has been the subject of some of the most valuable of recent researches in this department. Do they act mechanically as irritants? Or is their action privative, by stealing from the tissues elements which are necessary to their development? Or have they a power of elaborating (or secreting) new products, which exert a toxic influence on the affected body? This last view is supported by weighty evidence and by the analogy of the fermentation processes already referred to. It would therefore seem that the microbe has the power of disturbing—or rather that, in order to the preservation of its own life, the microbe is compelled to disturb—the molecular arrangement of the elements in the medium in which it is developing. The products thus elaborated have been termed *Ptomaines* (*Ptōma*). They were so named by Selmi, who discovered their presence in the dead body during various stages of putrefaction.

The ptomaine doctrine has been accepted in explanation of the process of septicæmia, and there is good reason for extending its application to the other infective processes. It is essential, however, to remember that, after the microbe has succeeded in invading the tissues, its further progress is not unopposed. There is a constant warfare between the living cells of the host and the living and multiplying cells of the invader, the contest being decided in favor of the stronger. The researches of Metschnikoff and others seem to show that the bacilli can be destroyed by the white corpuscles of the blood.

Granted that the organisms have entered the tissues or circulation, there still remain for the physician two modes of attack: (a) by attempting to exterminate the microbe itself through such agents as may be discovered to be possessed of germicidal properties; (b) by endeavoring to antagonize the poison which the microbe is distributing through the system. Many difficulties attend both methods, inasmuch as agents sufficiently potent to effect either object are themselves likely to prove injurious to the infected tissues. The aim of *curative medicine* is the discovery of remedies capable of preventing the growth of the microbe, yet innocuous to the host.

Reference must be made, in conclusion, to the question of immunity. It is well ascertained that certain animals are not susceptible to the attacks of certain pathogenic organisms, and that others suffer comparatively slightly. In man there may be traced the occurrence of individual immunity. Such facts have not yet received a satisfactory explanation. The almost universal immunity after a first attack of certain fevers and the comparative immunity from smallpox conferred by *VACCINATION* (*g. v.*) are of interest in this connection. The experiments of Pasteur and others on *Bacillus anthracis* indicate that by repeated cultivation under special conditions it is possible to lessen the virulence of the most virulent of organisms and that inoculation with this altered bacillus confers immunity against further attack. More striking still are the experiments of Pasteur in connection with rabies. By a special method that observer has accomplished an attenuation of the virus—the microbe not having been determined—whereby the

worst features of the disease are disturbed. By this means it has been found possible in cases of infection to anticipate a serious attack by the introduction of this modified virus. In explanation of this it has been supposed that a poisonous ptomaine is generated during the process, which, when injected in quantity during the stage of incubation of the disease, prevents the development of the supposititious germ. Those and other kindred observations disclose a most hopeful development of the germ theory in the direction of preventive inoculation.

GERONA, a city of Spain, the chief town of the province of Gerona (one of the four into which Catalonia was divided), is situated about fifty-four miles northeast of Barcelona, on the railway to Perpignan, in France, near the junction of the Ter and Oña. At present Gerona is a comparatively insignificant place, although it numbers about 15,000 inhabitants.

Gerona is the ancient *Gerunda*, a city of the Ausetani. It boasts that it is the place in which St. Paul and St. James first rested when they came to Spain; and it became the see of a bishop about 247. For a considerable period it was in the hands of the Moors, and their emir, Soleiman, was in alliance with Pepin about 759. It was taken by Charlemagne in 785; but the Moors regained and sacked it in 795, and it was not till 1015 that they were finally expelled. At a later date it gave the title of count to the king of Aragon's eldest son. In May, 1809, it was besieged by the French, with 35,000 troops, under Verdier, Augereau, and St. Cyr; forty batteries were erected against it, and a heavy bombardment maintained; but under the leadership of Mariano Alvarez it held out till famine and fever compelled a capitulation on December 12th. The French, it is said, had spent 20,000 bombs and 60,000 cannon balls, and their loss was estimated at 15,000 men killed and wounded.

GERRHA, an ancient city of Arabia Felix, on the west side of what is now the Persian Gulf, described by Strabo as inhabited by Chaldean exiles from Babylon, who built their houses of salt, and repaired them by the application of salt water.

GERSE, a department of France, composed of the whole or parts of the five old districts of Gascony, viz., Armagnac, Astarac, Lomagne, Comminges, and Condoms. It is bounded north by the department of Lot-et-Garonne, east by Tarn-et-Garonne and Haute-Garonne, south by Hautes-Pyrénées and Basses-Pyrénées, and west by Landes. It is about seventy-two miles in length from east to west, and fifty-three in breadth from north to south. This department is hilly, particularly in the south, where it is mostly covered with ramifications of the Pyrenees. There is seldom any snow, and there is scarcely any frost. More than half of the department is arable; about one-seventh is occupied by vines, and the rest is meadows, wood, or heath. The soil is not of great fertility, but is tolerably well cultivated, and the grain produced is more than sufficient for home consumption. About one-third of the wine produced is used for home consumption, and the remainder is chiefly manufactured into brandy, known by the name of Armagnac. The amount of brandy distilled in the department annually is about twenty-two million gallons. Gers is divided into the arrondissements of Auch, Lectoure, Mirande, Condom, and Lombez, with twenty-nine cantons and four hundred and sixty-seven communes. The chief town is Auch. The total area is 2,425 square miles, and the population (1901) is 236,204.

GERSON, JOHN, one of the most eminent scholars and divines of his time, was born at the village of Gerson, in the diocese of Rheims, December 14, 1363,

his proper name being Jean Charlier. He was educated in Paris, at the college of Navarre, under the celebrated Peter D'Ailly. Here he rose to the highest honors of the university, and ultimately to its chancellorship, having acquired by his extraordinary learning the title of Doctor Christianissimus. He was a clear and rational theologian, an enemy to scholastic subtleties, while his reason found rest from all its difficulties in a devout Christian mysticism. During the unhappy contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western schism, the university of Paris took a leading part in the negotiations for union; and Gerson was one of the most active supporters of the proposal of that university for putting an end to the schism by the resignation of both of the contending parties. With this view he visited the other universities, in order to obtain their assent to the plan proposed by that of Paris. But, although he had the satisfaction of seeing this plan carried out in the Council of Pisa, it failed, as is well known, to secure the desired union. In a treatise inscribed to his friend D'Ailly, he renewed the proposal that the rival pontiffs (now not two, but three, since the election of John XXIII. at Pisa) should be required to resign; and in the new council held at Constance, in 1414, he was again the most zealous advocate of the same expedient of resignation. But his own fortunes were marred by the animosity of the duke of Burgundy and his adherents, to whom Gerson became obnoxious, and from whom he had already suffered much persecution on account of the boldness with which he had denounced the murder of the Duke of Orleans. To escape his vengeance he was forced to remain in exile; and he retired from Constance, in the disguise of a pilgrim, to Rattenberg in the Tyrol, where he composed his celebrated work, *De Consolatione Philosophiae*. It was only after the lapse of several years that he was enabled to return to France and take up his residence in a monastery at Lyons, of which his brother was the superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. The only fee he took from his pupils was a promise to repeat the prayer, "Lord have mercy on thy poor servant, Gerson." He died July 12, 1429, in his sixty-sixth year. His works fill five volumes in folio (Antwerp, 1706). The famous treatise on the *Imitation of Christ* has been ascribed to him by some writers, but it is now hardly doubtful that the true author was Thomas à Kempis. The authority of Gerson is much relied on by the advocates of Gallican principles; but the Ultramontanes allege that the principles laid down by him as to the authority of the Pope are only applicable to the exceptional case in which he wrote, viz., that of a disputed succession, in which the claim of each of the rival popes, and therefore of the existing papacy itself, was doubtful. See the studies by Charles Schmidt (Strasburg, 1839), and Schwab (Wurzburg, 1858).

GERSONIDES, or BEN GERSON, LEVI, a distinguished Jewish philosopher and commentator, was born at Bagnolo, in Languedoc, toward the close of the thirteenth century, probably in 1288. He is believed to have died at Perpignan in 1370. Part of his writings consist of commentaries on the portions of Aristotle then known, or rather of commentaries on the commentaries of Averroes. Some of these are printed in the early Latin editions of Aristotle's works. His most important treatise, that in which he has a place in the history of philosophy, is entitled *Milhamoth Adonai* (The Wars of God), and is said to have occupied twelve years in composition.

GERSTÄCKER, FRIEDRICH, who enjoyed a most extensive popularity as a novelist and a writer of travels

both at home and abroad, was born at Hamburg in 1816.

He traveled in 1837 on foot over all parts of the United States, working as he went for his bare subsistence, and then settled for some time in Arkansas, where he led the life of a roving sportsman. Only now and then he visited inhabited places to see civilized society, and to earn some means by whatever work he could obtain. Thus he went in 1842 to Point Coupée in Louisiana, where he undertook the management of a hotel. This time, however, he did not return with the acquired means to the backwoods, but repaired to his German home to see his mother and other relatives, after having led an adventurous life for six years and a half. On his return to Germany he found himself, to his great surprise, known as an author, on a limited scale at least. His mother had shown his diary, which he regularly sent home, and which contained descriptions of his adventures in the New World, to the editor of the *Rosen*, who readily published them in his periodical. The traveling sketches having found great favor with the German public, Gerstäcker issued them, in 1844, in a collected form, under the title of *Streif- und Jagdzüge durch die Vereinigten Staaten Nordamerikas*. His next literary labors consisted of translations from the English, during the performance of which it occurred to him that he might himself become an original author, since he was able to delineate original characters, to relate remarkable occurrences, and to describe romantic scenery from his own experience, whilst others were obliged to draw upon their imagination only in producing works of fiction. Accordingly Gerstäcker issued, in 1845, his first novel, *Die Regulatoren in Arkansas*, and henceforth the stream of his productivity flowed on uninterruptedly. In 1849 he again repaired to America, being this time provided with a grant from the then "German Government," and acting at the same time as correspondent to the *Augsburger Allgem. Zeitung*. After having made very extensive travels both in America, Polynesia, and Australia, he returned in 1852 to Leipzig. In 1860 his innate restlessness drove him to South America, chiefly with a view of inspecting the German colonies there. After having traversed nearly all the principal South American countries, he returned to Germany, but for a short time only, for in 1862 he accompanied the Duke Ernest of Coburg-Gotha to Egypt and Abyssinia. This was his last great journey, after the return from which he lived first near Gotha and then at Brunswick, where he died on May 31, 1872.

GERVAIS, PAUL (1816-1879), an eminent palæontologist, was born in September at Paris, where he obtained the diplomas of doctor of science and of medicine, and in 1835, as assistant to De Blainville in the laboratory of comparative anatomy at the Museum of Natural History, commenced palæontological research. Gervais was remarkable for the disinterestedness with which he devoted himself to the cause of science.

GERVAISE OF CANTERBURY, born about 1150, was one of the monks of the priory of Christ Church, Canterbury, and witnessed the burning of the cathedral in 1174. He is known as a trustworthy chronicler of English history.

GERVAISE, or GERVAISE, of Tilbury (*Gervasius Tilburiensis*), an English Latin writer of the thirteenth century, was probably born at Tilbury in Essex.

GERVINUS, GEORG GOTTFRIED, one of the most eminent literary and political historians of Germany, was born 1805, at Darmstadt. In 1826 he went to Heidelberg, where he attended the lectures of the great historian Schlosser, who became henceforth his guide and his model. From 1828 to 1830 he held a mastership in a private institution at Frankfort-on-the-Main,

issuing at the same time, in conjunction with Morstadt and Hertlein, a comprehensive edition of Thucydides, and writing an essay on Bloomfield's English translation of the Greek historian. In 1830 he returned to Heidelberg, and wrote among other essays one on Probert's *Ancient Laws of Cambria*. The year 1832 he spent in Italy as traveling tutor to a young Englishman, and on his return to Heidelberg he wrote several historical treatises, which he issued in 1833, in a collected form, as the first volume of his *Historische Schriften*. In 1837 he wrote his *Grundzüge der Historik*, which is perhaps the most thoughtful of his philosophico-historical productions. Gervinus, in 1848, took refuge among his literary and historical studies, more especially devoting himself to the study of Shakespeare, the result of which was his great work *Shakespeare* (1849-1850), in four volumes. He also revised his *magnum opus*, the *History of German Literature*, for a fourth edition (1853), and began at the same time to plan his *History of the Nineteenth Century*, which was to be a continuation of the *History of the Eighteenth Century*, by his guide and teacher, Schlosser. With unwearied energy he devoted himself to his above-mentioned great historical work, *Geschichte des neunzehnten Jahrhunderts seit den Wiener Verträgen*, which he issued in eight volumes, the first in 1855, and the last in 1866. He founded, and liberally supported, the Handel Society in Germany, whose object it was to restore the compositions of the great master in an authentic form, and to issue German versions of the texts suitable to the compositions. The result of his Handel studies was his critical and æsthetical work, *Händel und Shakespeare, zur Ästhetik der Tonkunst* (1868). He died rather suddenly, March 18, 1871.

GESENIUS, FRIEDRICH HEINRICH WILHELM, one of the greatest of German Orientalists and Biblical scholars, was born at Nordhausen, February 3, 1786, studied at Helmstedt and Göttingen, and at Halle in 1810 became extraordinary, in 1811 ordinary, professor of theology. Here he lectured for more than thirty years, broken only by the closing of the university during the war of liberation (1813-14), and by lengthened visits to France and England in 1820, to England and Holland in 1835. Among his pupils were Von Bohlen, Hoffmann, Hupfeld, Rödiger, Tuch, Vatke and Benfey. He died October 23, 1842. His first great work was his *Hebräisches u. Chaldäisches Handwörterbuch* (1810-12; 10th ed., revised by Muhlau and Volck, 1886; English translation by Tregelles, 1846-52). His *Hebr. Elementarbuch*, consisting of the *Hebräische Grammatik* (1813; 24th ed. by Kautzesch, 1885), and the *Hebräisches Lesebuch* (1814; 11th ed., by Heiligstedt, 1873), have contributed enormously to the knowledge of the Hebrew language, not only in Germany, but through the translations also in England and America. Later works are his *Kritische Gesch. d. Hebr. Sprache u. Schrift* (1815), *De Pentateuchi Samaritani Origine, Indole, et Auctoritate* (1815), *Grammatisch-kritisches Lehrgebäude d. Hebr. Sprache* (1817), and a new translation of and commentary on Isaiah (1820-21). His greatest work is the monumental *Thesaurus philologicus criticus Lingue Hebraicæ et Chaldaicæ Veteris Testamenti*, of which the first part was published in 1829, but which was completed only in 1858 by Professor Rödiger. Many of the results of the rationalizing method of interpreting the Old Testament, which characterizes all the works of Gesenius, have been unable to stand the test of modern Biblical science. He has certainly been surpassed by Ewald in insight into the genius of the Hebrew language, and its bearing on the interpretation of Hebrew life and thought, as well as in all that qualifies the critic for a true historical, æsthetical, and

religious appreciation of the literature preserved to us in the Old Testament. Yet his intense devotion to his favorite studies, and the advance which he made beyond all his predecessors in the establishment of more certain principles of Hebrew philology, undoubtedly entitle him to be regarded as having constituted a new epoch in the scientific study of the Old Testament. A fine sketch of his life was published at Berlin in 1843.

GESNER, KONRAD VON, a Swiss naturalist, sometimes called the German Pliny, was born at Zurich, March 26, 1516. All his life long he was passionately devoted to the pursuit of knowledge, especially knowledge of the natural sciences. His early studies in medicine, natural history, and Greek and Latin literature, were prosecuted at Zurich, Strasburg, Bourges and Paris. Returning home in 1535, he earned his living by teaching, until, in 1537, he was appointed professor of Greek at Lausanne. This chair, however, he exchanged four years later for that of Physics and Natural History at Zurich, where he taught and practiced as a physician until his death, on December 13, 1565. He was also an indefatigable writer of books, and in the course of his life published no less than seventy-two works, besides leaving at his death eighteen others in progress. His *Bibliotheca Universalis* (1545) contained the titles of all the books then known in Greek, Hebrew, and Latin, unpublished as well as published, with criticisms and summaries of each; its second part, *Pandectarum sive Partitionum Universalium Libri XXI.*, came out in 1548-49. His next undertaking, by far the greatest of his literary works, was the *Historia Animalium* (1551-58). The first book treats of viviparous quadrupeds, the second of oviparous animals (tortoises, lizards, etc.), the third of birds, and the fourth of fishes and aquatic animals. The other books, never completed, were to have contained the history of serpents and insects. In this work, which will ever remain a monument of his untiring industry, he aimed at bringing together all that was known in his time concerning every animal. But botany was probably the section of natural history with which he had the greatest practical acquaintance. He had collected more than five hundred plants undescribed by the ancients, and was arranging the results of his labors in this department for a third *magnum opus* at the time of his death. He appears to have been the first who made the great step toward a scientific classification of distinguishing genera by the fructification. He also wrote on other branches of science, as medicine and mineralogy, and composed a great number of works dealing with the ancient classics, the *Mithridates sive de Differentiâ Linguarum* (1555), being the most notable. See Hanhart's *Konrad Gesner* (Winterthur, 1824).

GESNER, SALOMON, Swiss painter and poet, and once a very favorite and widely-read author, was born at Zurich, Switzerland, April 1, 1730. His landscape paintings are all in the conventional classic style, but his engravings are of considerable merit. He died March 2, 1788.

GESTA ROMANORUM ("the deeds of the Romans"), the title of a collection of short stories and legends, in the Latin tongue, widely spread during the middle ages, but of the authorship of which little is known save that it took its present form more likely in England, about the end of the thirteenth or the beginning of the fourteenth century. The stories are invariably moralized, and in fact the edifying purpose throughout is the sole unifying element of the collection. The title is only so far descriptive as the nucleus of the collection consists of stories from Roman history, or rather pieces from Roman writers, not necessarily of any greater historical value than that of Androcles and the lion from Aulus Gellius. Moralized mystical and religious tales, as well

as other pieces, many of ultimate Oriental origin, were afterward added, and upon them edifying conclusions hung but awkwardly, bringing the whole up to about 180 chapters. Oosterley supposes its origin to have been English; the claims to its authorship of the Benedictine prior at Paris, Petrus Berchorius (died 1362), or of a certain Helinandus, may safely be set aside. The style and narrative faculty displayed deserve but little commendation, but the book has a unique interest as at least the immediate source of many stories that have filled a large place in literature. It is enough to mention the stories "Of Feminine Subtlety" (120), retold in verse by Hoccleve; "Of the Coming of the Devil, and of the Secret Judgments of God" (80), the Story of Parnell's *Hermit*; "Of Women, who do not only betray secrets but lie fearfully" (125); the story of the sixty black crows, the foundation of Doctor Byrom's clever poem, *The Three Black Cows*; "Of too much pride, and how the proud are frequently compelled to endure some notable humiliation" (59); a story of the Emperor Jovinian, the same as that of King Robert of Sicily, as versified by Longfellow; "Of the Transgressions and Wounds of the Soul" (102), the same as "The Leech of Folkstone" in the *Ingoldsby Legends*; "Of Mental Constancy" (172), a version of the romance of Guy of Warwick; and "Of Ingratitude" (25), and "Of Constancy" (66), together supplying the ground work of Rossetti's poem, *The Staff and Scrip*. Here also may be found what are substantially the same stories as Chaucer's *Man of Lawes Tale*, and Shakespeare's *King Lear* and *Merchant of Venice*. One tale "Of the Game of Schaci" (166), is a somewhat obscure description of the game of chess. The longest story, "Of Temporal Tribulation" (153), is that of the adventures of Apollonius of Tyre, his wife and daughter, as in Gower's *Confessio Amantis*, and in *Pericles*. Gower, however, took it from the *Pantheon* (end of the thirteenth century) of Godfrey of Viterbo. Enough has been said to show that great part of the stories belong alike in form and substance to the ancient story stock of Europe, and hence the book must be studied side by side with the romance of Barlaam and Josaphat, the *Disciplina Clericalis* of Petrus Alphonsus, the *Otia Imperialia* of Gervase of Tilbury, Voragine's *Golden Legend*, the *Speculum Historiale* of Vincent of Beauvais, and the medieval fables connected with the name of Æsop, no less than with such works of literary elaboration as the *Arabian Nights*, the *Talmud*, the *Fabliaux*, the *Decameron*, and the *Canterbury Tales*.

The stories in the *Gesta Romanorum* are mostly bald and inartistic, seldom, if ever, relieved by a touch of pathos or a gleam of humor, and never by any chance reaching the region of the really dramatic; yet they have a rare literary charm of their own in their utter naiveté and artlessness, as well as in the beautiful simplicity of their moralization, based on a piety that questions nothing or finds relief in an unfathomed mysticism. Some of the best stories are those that gird at the weaknesses or faults of women—a direction in which monkish wit was ever prone to turn.

The modern form of the *Gesta Romanorum* is, as has been said, a collection of 181 stories, first printed about 1473, but no MS. corresponding exactly to which exists. The first printed edition was issued at Utrecht in 150 chapters; the second forming the standard text, within 181 chapters, at Cologne. Although both of these are undated, Oosterley proves that their publication falls between 1472 and 1475. An edition in English was printed by Wynkyn de Worde (1510-15), from MSS. differing widely from those reproduced in the early printed Latin versions. Oosterley divides the num-

erous MSS. into three groups or families: (1) the English group written in Latin, the best representative of which has 102 chapters, of which seventy-two are found in the standard text; (2) the group of German and Latin MSS. represented by an edition printed in German at Augsburg in 1489; and (3) a group of MSS. represented by the standard text influenced by distinct collections of stories, as Robert Holkot's *Moralisationes Pulchræ in Usum Predicatorum* and the like. The striking diversity between the MSS. in England and the printed collection led Douce to believe that there were two distinct collections of stories, one of German, and one of English origin. Oesterley's conclusion is that this *Gesta* was originally compiled in England, that it passed quickly to the continent and was there altered considerably before being printed, and that both the two first printed editions were compiled from several MSS. The second (the standard) formed the largest, and, reaching England before any of the native MSS. had been printed became accepted as the standard form for the printed text in spite of its many divergences from the MSS. that still existed.

An English version, by the Rev. C. Swan, was printed in two volumes, in 1824; in a revised form, by Wynnard Hooper, in Bohn's "Antiquarian Library," in 1877. Sir F. Madden edited *The Early English Versions of the Gesta Romanorum* for the Roxburghe Club, in 1838; Mr. Sidney J. H. Herrtage for the Early English Text Society, in 1879. Critical editions of the Latin text have been edited by A. Keller (Stuttgart, 1842), and H. Oesterley (Berlin, 1872), the last with a masterly introduction. See also the Dissertation in Warton's *History of English Poetry*, and in vol. ii., of Douce's *Illustrations of Shakespeare*; but these must not now be followed implicitly.

GESTATION, the retention of the mammalian embryo in the uterus. The period of gestation—i. e., between the fertilization of the ovum and the extrusion of the fetus—varies greatly, from about 18 days in the opossum and 30 days in the rabbit to about 280 in man and 600 in an elephant. Robert Chambers, in his *Vestiges of Creation*, emphasized the importance of prolonged gestation as a factor of evolution, and it is certain that the more highly evolved mammals have longer periods of pregnancy than the lower. The size of the animal, the number of offspring at a birth, and the degree of their maturity at birth, have also to be considered; thus, the gestation of a cow and sheep last about 280 and 150 days respectively; those of mare and bitch about 350 and 60 days respectively; those of giraffe and kangaroo about 420 and 40 days respectively. In the marsupials, where the placental union between mother and offspring is still undeveloped, the birth is almost always very precocious; but in most cases the young are stowed away after birth in the external pouch. The lowest mammals—duckmole and Echinæ—are oviparous.

GETA, PUBLIUS SEPTIMUS ANTONINUS, younger son of the Roman emperor Severus, was born at Milan, 189 A. D. Between him and his brother Caracalla there existed from their early years a keen rivalry and antipathy. On the death of their father in 211 they were, in accordance with his instructions, proclaimed joint emperors; and after the failure of a proposed treaty by which Caracalla was to retain Europe and western Africa, and Geta Asia and Egypt, Caracalla, on the pretense of a desire for reconciliation, arranged a meeting with his brother in his mother's apartments, and by means of assassins murdered him in her presence (212). His name was obliterated from all public inscriptions; all coins bearing his effigy were to be destroyed; and the use of

his name, either in conversation or in writing was forbidden under pain of death.

GETÆ, a people of Thracian extraction, who are first mentioned in history as dwelling on the right bank of the Danube, but who in the middle of the fourth century B. C. crossed that river and settled in Transylvania and Wallachia. They were conquered by Darius Hystaspes in 515 B. C. and then accompanied him in his campaign against the Scythians. Both Alexander the Great in 335 and Lysimachus, in 292 made attempts to subdue them, but neither was successful. During the first half of the first century B. C. they became politically united with the Dacians, a cognate race who had settled in their territories.

GETHESEMANE (Heb. *gath*, "a wine-press," and *shemen*, "oil,") the scene of our Savior's agony on the night before his Passion, was a small farm or estate at the foot of Mount Olivet, somewhere on the east slope of the Kedron valley, and rather more than half a mile from the city of Jerusalem. Attached to it was a garden or orchard, a favorite resort of Christ and his disciples. An enclosure with a few old olive-trees is now pointed out to travelers as the site of the garden.

GETTYSBURG, a small town in Adams county, Pa., is a manufacturing center of some importance, having flour mills, foundries, tanneries, etc. It has ample railroad, banking, and telegraph facilities, and is slowly, but steadily increasing in importance. It has a population (1900) of 3,495. The chief interest, however, attaching to the town is in connection with the great battle fought there on July 1-3, 1863, between the Confederate forces under Gen. R. E. Lee, and the Union forces under Gen. George G. Meade, resulting in a Federal victory. Near the town are numerous monuments commemorating incidents of the battle.

From the beginning of the war up to the date of the battle of Gettysburg, the success of the Army of Northern Virginia, under its various commanders, had been uninterrupted, except in case of a few minor affairs—hardly to be dignified as more than skirmishes. McDowell had been met and defeated at Bull Run; McClellan, who had superseded him, had met his defeat at the outskirts of Richmond, the city he had boastfully undertaken to reduce in a short time; Pope had shared the same fate at the second battle of Bull Run; and McClellan had again failed to defeat Lee at Antietam. Burnside had been crushed at Fredericksburg, and "Fighting Joe" Hooker had been driven back from Chancellorsville across the Rappahannock, where he lay at Fallmouth, opposite Fredericksburg. The position occupied by both armies, as they faced each other, being too strong to present any reasonable hope of successful attack, General Lee determined on a second invasion of Northern territory with the hope of drawing Hooker from his position and uncovering important points in his movements. As an initial movement he ordered General Ewell to move up the valley of Virginia and clear it of whatever Union forces there might be found. To execute this order Ewell proceeded at once, and having struck Milroy's command, forced that general to cross the Potomac. Ewell's advance up the valley was immediately followed by Longstreet and A. P. Hill, General Lee bringing up the rear in person. This movement had the effect of causing General Hooker to withdraw from before Fredericksburg and take up a position at Leesburg, between General Lee's army and Washington, which city was the object of his solicitude, it being imperatively necessary to cover it from attack. Meantime General Lee crossed the Potomac and marched into Pennsylvania, arriving at Chambersburg June 27th. General Lee, in the disposition of his forces

had made the mistake of leaving General Stuart behind him to watch the movement of the Federal troops, and his lack of necessary information caused him to run unexpectedly upon General Meade's forces at Gettysburg. This blunder was due to the fact that General Lee had been led to believe, by the prolonged absence of Stuart, that the enemy instead of advancing to meet him in full force in Northern territory, were attempting to execute a counter-movement on Richmond by recrossing the Potomac and getting in his rear. In the meantime (June 28, 1863), General Hooker had been superseded by General Meade, who, contrary to Lee's belief, had pushed on to Gettysburg, instead of moving to the south, and on the evening of June 30, 1863, the advance guard of Lee's army encountered the Federals as above stated. This force, under General Heth, were under orders to make a reconnoissance in order to ascertain the strength of the enemy, and not to engage in a general action—in fact General Lee seems not to have suspected at first that it was the main body of the Federals he had encountered—but by the next morning it became apparent that a general engagement could not be avoided, and General Lee then hastened to bring up his troops and hurry forward all his reserves.

The situation of Gettysburg is in a depression between parallel ranges of broken ridges, which beyond the western extremity of the town flatten out in a plain. Here on the crest of the ridge to the west is the Lutheran seminary which gave name to the famous "Seminary Ridge," and upon this high ground General Buford, whose cavalry opened the fight, was posted on the morning of July 1st, at the same time guarding every approach to the town. The battle opened about 9 o'clock, Gen. A. P. Hill's division, with Heth's command in the lead, striking Buford's cavalry about a mile and a half from the town. Buford was slowly driven back, but was soon reinforced by Reynold's command. Wadsworth's and Doubleday's divisions, together with Robinson's division, followed in succession, and by 10 o'clock the various important points about the town were occupied by the Federal troops. Soon after, the Confederate General Archer led the first charge against the Federals, striking Meredith's command, which occupied a position to the left of the Chambersburg road and extending southwardly to a small run or "branch." The charge was repulsed with heavy loss and Archer himself was captured. But in a short while A. P. Hill threw forward another assaulting party and Meredith was driven back. By 12 o'clock all of the first corps of the Federal army had reached the field, and was reinforced by a portion of the eleventh, numbering according to official reports, with Buford's cavalry, about 23,000, and these during the whole day bore the brunt of the battle, being opposed by a larger Confederate force, but were forced back through the town to the heights beyond—now known as the Cemetery ridge. During the night the scattered commands of both armies came up and all that night and until 4 o'clock the following day nothing of any importance transpired, the day being consumed by each army in the disposition of their forces for the desperate battle soon to follow.

Promptly at 4 o'clock the signal for attack was given and the Confederates, under Hood, advance, followed by McLaws. The Federal troops, after two hours' fighting, retired to Little Round Top, and here, amidst obstacles of every sort, was fought one of the bloodiest contests of the war. The Confederates were repulsed here, and the Federals occupied Big Round Top, securing Meade's flank from further danger. Meanwhile A. P. Hill's division had at first been successful in their assault on Humphrey's position, but at last were driven

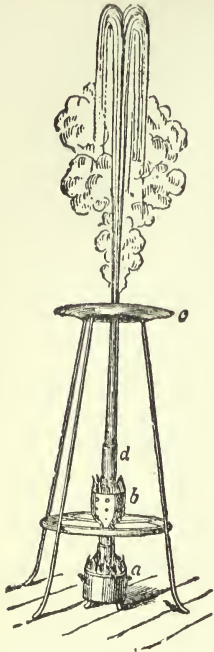
back, and their repulse had left Meade's left safe, and enabled him to send the sixth corps to support the fifth, which was on Big and Little Round Tops. General Ewell, through some accident, did not get the signal to engage his command until it was too late for him to accomplish any good, and after a bloody battle between a portion of his troops and the Federals, which lasted till 9 P. M., the contest was adjourned till the next day. It was during the second day's fighting that General Gordon's brigade made their charge on Cemetery Hill. By 5:30 next morning the contest was renewed. From that time till 10:30 Slocum was the object of attack, but all to no purpose, and Johnson's Confederates were driven out of the barricades and trenches which they had taken from the Federals, and the former owners occupied them. General Lee tried by concentrated artillery fire to open a path for a charge by his troops by which means he hoped to carry the Federal position by assault. For this attack he chose a point between Little Round Top and Ziegler's grove. All along the line of this advance were stone walls and barricades, and behind these were posted Hancock's men. After a furious fire from the Confederate artillery Pickett's division at 2:30 P. M. rushed forward up the slope in its famous charge, but it was a useless sacrifice. Although a slight breach was made in the Federal lines momentarily, the damage was quickly repaired, and the battle was decided in favor of the Union forces. There was but little of importance done after this fearful charge, and in a short time Lee's shattered forces were in retreat toward Virginia. The total Confederate losses (disputed) are said to be 26,000; total Federal losses, 23,000. Among the Confederate wounded were Major-generals Hood and Heth, Brigadier-generals Semmes, Barksdale, Kemper, Anderson, Pettigrew and Scales. Confederate killed: Major-general Pender, Brigadier-generals Garnett, Armistead and Jones. Several Confederate generals were captured. Among the Union officers killed were Generals Reynolds, Zook and Weed; Colonels Cross, Willard, Sherrill and Vincent. Among the wounded were Generals Hancock, Meredith, Gibbon, Sickles, Paul, Tyler, Graham and Barlow. Several others were captured. The losses on both sides were very large, being nearly one-fifth of the numbers engaged. The estimated size of the two armies places them on about an equal footing. This battle, in the opinion of the military critics, decided the fate of the Confederacy. At Gettysburg its military power was broken, and from that point onward its path was one of continual decline till the surrender at Appomattox.

GEULINCX, ARNOLD, one of the most distinguished of the earlier Cartesians, was born at Antwerp in 1625. Few details are known with regard to his life, and his more important works are extremely rare.

GEUM, a genus of Rosaceæ, sub-order Potentilleæ, distinguished from Potentilla by the hardened hooked styles which crown the carpels, so that the fruit becomes a bur. Two species are common natives of Britain, *G. urbanum*, the Wood Avens or Herb Bennet, and *G. rivale*, Water Avens, the former with erect yellow flowers of a brownish hue. The former grows in hedges and thickets, the latter in wet meadows and woods, and sometimes even in very alpine situations. *G. canadense*, the Chocolate Root or Blood Root of North America enjoys a considerable reputation as a mild tonic. Some varieties of the genus are used in preparing liqueurs.

GEX, a town of France, the chief town of an arrondissement in the department of Ain, is beautifully situated at the base of the Jura chain on the Journant, three miles from the Swiss frontier, and ten miles north-west of Geneva. Population, 9,000.

GEYSERS, GEISERS, or GEISIRS, are fountains of a peculiar construction, in virtue of which they shoot up into the air, at more or less irregular intervals of time, a column of heated water and steam or of mud.



ARTIFICIAL GEYSER.

Those of Iceland have been known at least from the time of Saxo Grammaticus, who briefly mentions them in his history of Danish kings; but no satisfactory explanation of the phenomena was advanced till near the middle of the present century, when Bunsen brought his scientific knowledge and power of investigation to bear on the subject. By Bunsen's theory the whole difficulty is solved, as is beautifully demonstrated by the artificial geyser designed by Professor J. H. J. Müller of Freiburg. If the tube *ab* be filled with water and heated at two points, first at *a* and then at *b*, the following succession of changes is produced. The water at *a* beginning to boil, the superincumbent column is consequently raised, and the stratum of water which was on the point of boiling at *b* being raised to *d* is there subjected to a diminished pressure; a sudden evolution of steam accordingly takes place at *d*, and the superincumbent water is violently ejected. Received in the basin *c*, the air-cooled water sinks back into the tube, and the temperature of the whole column is consequently lowered; but the under strata of water are naturally those which are least affected by the cooling process; the boiling begins again at *A*, and the same succession of events is the result. The principal difference between the artificial and the natural geyser-tube is that in the latter the effect is not necessarily produced by two distinct sources of heat like the two fires of the experimental apparatus, but by the continual influx of heat from the bottom of the shaft and the differences between the boiling points of the different parts of the column owing to the different pressures of the superincumbent mass.

Any hot springs capable of depositing siliceous material by the evaporation of its water may in course of time transform itself into a geyser, a tube being gradually built up as the level of the basin is raised. And every geyser continuing to deposit siliceous material is preparing its own destruction; for, as soon as the tube becomes deep enough to contain a column of water sufficiently heavy to prevent the lower strata attaining their boiling points, the whole mechanism is deranged. In geyser districts it is easy to find thermal springs busy with the construction of the tube; warm pools or *laugs*, as the Icelanders call them, on the top of siliceous mounds, with the mouth of the shaft still open in the middle; and dry basins from which the water has receded with their shafts now choked with rubbish.

Geysers exist at the present time in many volcanic regions, as in the Eastern Archipelago, Japan, and South

America; but the three localities where they attain their highest development are Iceland, New Zealand and in the Yellowstone Park region. The very name by which we call them indicates the historical priority of the Iceland group. It is an old Icelandic word—*geysir*, equivalent to gusher or rager—from the verb *geysa*, itself a derivative of *gjosa*, to gush. In native use it is the proper name of the Great Geyser, and not an appellative—the general term *hver*, a hot spring, making the nearest approach to the European sense of the word.

The Iceland geysers are situated about fifty miles northwest of Hecla, in a broad valley of alluvial formation, at the foot of a range of hills from 300 to 400 feet in height. Within a circuit of about two miles, upward of one hundred hot springs may be counted, varying greatly both in character and dimensions. The Great Geyser in its calm periods appears as a circular pool seventy-two feet in diameter and four feet in depth, occupying a basin on the summit of a mound of siliceous concretion; and in the center of the basin is a shaft, about nine feet in diameter and seventy feet in depth, lined with the same siliceous material. The clear sea-green water flows over the eastern rim of the basin in little runnels. On the surface it has a temperature of from 76° to 89° Cent., or from 168° to 188° Fahr. Within the shaft there is, of course, a continual shifting both of the average temperature of the column and of the relative temperatures of the several strata.

About 100 paces from the Great Geyser is the *Strokker* or churn, which was first described by Stanley in 1789. The shaft in this case is about forty-four feet deep, and, instead of being cylindrical, is funnel-shaped, having a width of about eight feet at the mouth, but contracting to about ten inches near the center. By casting stones or turf into the shaft so as to stopper the narrow neck, eruptions can be accelerated, and they often exceed in magnitude those of the Great Geyser itself.

The great geyser-district of New Zealand is situated in the south of the province of Auckland, in or near the upper basin of the Waikato river to the northeast of lake Taupo. In many respects the scene presented in various parts of the district is far more striking and beautiful than anything of the same kind to be found in Iceland, but this is due not so much to the grandeur of the geysers proper as to the bewildering profusion of boiling springs, steam jets, and mud volcanoes, and to the fantastic effects produced on the rocks by the siliceous deposits, and by the action of the boiling water. But it is in the Yellowstone Park, in the northwest corner of Wyoming, that the various phenomena of the geysers can be observed on the most portentous scale. The geysers themselves are to be counted by hundreds, and the dimensions and activity of several of them render those of Iceland and New Zealand almost insignificant in comparison. The principal groups are situated along the course of that tributary of the Upper Madison which bears the name of Fire Hole River. Many of the individual geysers have very distinct characteristics in the form and color of the mound, in the style of the eruption, and in the shape of the column. The "Giantess," as observed by Langford (1870) and Dunraven (1874), lifts the main column to a height of only fifty or sixty feet, but shoots a thin spire to no less than 250 feet. The "Castle" varies in height from ten or fifteen to 250 feet; and on the occasions of greatest effort the noise is appalling, and shakes the ground like an earthquake. "Old Faithful" owes its name to the regularity of its action. Its eruptions, which raise the water to a height of 100 or 150 feet, last for about five minutes, and recur every three-quarters of an hour. The "Beehive" sometimes attains a height of 219 feet;

and the water, instead of falling back into the basin, is dissipated in spray and vapor.

GEZER, a royal Canaanite city on the boundary of Ephraim in the maritime plain. It was allotted to the Levites, but its original inhabitants were not driven out until the time of Solomon, when the Egyptians took the city, which was given to Solomon's wife.

GFRÖRER, AUGUST FRIEDRICH, a German historian, was born at Calw, in the Black Forest, March 5, 1803. He studied theology at Tübingen, next lived at Lausanne, Geneva, and Rome, becoming on his return in 1828 a *Repetent* at Tübingen, and in 1830 librarian at Stuttgart. He now gave himself with much zeal to historical studies, of which the first fruit was his *Philo und die Jüdisch-Alexandrinische Theosophie* (1831), followed by *Gustav Adolf* (1835), a work which aimed at bringing into prominence the political rather than the religious rôle of the great Swedish king. His *Geschichte des Urchristenthums* (1838) was called forth by the greater work of Strauss. In his *Allgemeine Kirchengeschichte* (1841-46), coming down to 1305, he first spoke out his admiration for the polity of the Roman Church. Soon after he was called to the chair of History at Freiburg, and in 1848 he was sent to the Frankfurt parliament, where he was one of the most decided adherents of the party called the *Grossdeutschen*, the fanatical opponents of Prussia. He formally went over to Rome in 1853, and thereafter was distinguished by his large share of the intolerance of the convert, although all the while he was never a dogmatically satisfactory Catholic. He died at Carlsbad July 6, 1861. His most important other works were *Geschichte der Karolinger* (1848) and *Papst Gregorius VII.* (1859-61). All his works are learned, often perversely so; his conclusions are too often more ingenious than sound.

GHÁTS, or GHÁUTS (in English "gates, passes, or landing stairs"), Eastern and Western. Two converging ranges of mountains which run parallel with the east and west coast of Southern India, and meet at an angle near Cape Comorin. (1) The Eastern Gháts commence in the vicinity of Balasor, a little north of the Mahanadi and run through Madras, with an average height of 1,500 feet, for the most part at a distance of from 50 to 150 miles from the coast. They are nowhere a watershed on any considerable scale, being penetrated and crossed by nearly all the drainage of the interior. (2) The Western Gháts stretch from the valley of the Tapti, in about the same latitude as Balasor to their junction with the kindred ridge, and to Cape Comorin itself. Though they are generally far more continuous and distinct than the Eastern Gháts, yet they are sharply divided by the gap of Palghát, the northern section measuring 800 miles in length, and the southern 200. Their general elevation varies from about 3,000 feet to upward of 7,000; the peak of Dodabetta, in the Nilgiri hills, is 8,760 feet above the sea level. The opposite faces of these mountains differ very remarkably from each other. Landward, there is a gradual slope to the table land of the Deccan; seaward, almost perpendicular precipices, speaking generally, sink at once nearly to the level of the sea, with only a comparatively narrow strip between them and the shore. This peculiarity, along with the heavy rainfall, brought by the southwest small monsoon, causes, more particularly toward the south, that singular feature of the country which is known as the "Backwaters."

The Western Gháts are a watershed, for not a single stream of any magnitude finds its way through them. Their vast primeval forests display some of the most magnificent scenery in India, and supply abundance of the finest timber. In the south there is a railway from Bèypur to Madras, finding a comparatively easy access

to the interior by the Palghat valley. In the north, near Bombay, two railways scale the precipitous face of the western Gháts. Of these, the line up the tremendous ravine of the Bhor Ghát, forty miles southeast of Bombay, is regarded as one of the greatest engineering feats ever accomplished in India. The railway rises by a lift of fifteen and one-half miles to a height of 1,831 feet, twisting around the mountains on narrow ledges that are often half embankment, or that rest on high vaulted arches, and passing through tunnels that aggregate 2,535 yards. Besides eight viaducts, there are eighteen bridges and fifty-eight culverts, and the average gradient is one in forty-eight.

The name Gháts is also applied to the flights of steps, whether intended as landing-places or as bathing-stairs, which line the river banks and towns and places of pilgrimage in northern and central India. Most great rivers, and especially the Ganges, possess many Gháts; but they are also built on the margins of lakes, as at Pushkar and Sagar, or even of tanks. The uniformity of the long lines of steps is often broken by shrines or temples, built either close to the waters edge or at the top; and on these steps are concentrated the pastimes of the idler, the duties of the devout, and much of the necessary intercourse of business. The Gháts of Benares, Hardwar, Panharpur, and of Maheswar, on the Nerbudda, are noteworthy either for their number or beauty, while Cawnpore, Sadullapur, the ruined city of Gaur, and other places possess noted "burning gháts," for purposes of cremation. See also Fergusson's *Handbook of Architecture*.

GHAZALI, ABU MOHAMMED AL-, known in the west as Algazel, a Moslem theologian who, in the eleventh century, struck a serious blow at the scholastic philosophy of the Arabians. Born at Tus, in Khorasan, in 1058, he studied in his native city and at Nishapur, being especially nurtured on the principles of Sufism. When thirty-three years old he was appointed by the grand-vizier of Bagdad to a chair of philosophy in the university of that city. But four years later he set off for Mecca; then spent ten years lecturing at Damascus; and finally went on to Jerusalem and Alexandria, where also he taught with signal success. In the end, however, he returned to Tus, where he founded a Sufic college and dedicated the remainder of his life until 1111, the year of his death, to religious and philosophic contemplation. The most notable of his numerous works are: *Opinions of the Philosophers and Tendencies of the Philosophers*. This latter is virtually an introduction to the more famous *Destruction of the Philosophers*, in which he challenges the methods and conclusions of the current scholasticism of Arabian philosophy. He also wrote a commentary on the ninety-nine names of God, several ethical treatises, and various other works on religion and philosophy. Several of his works have never yet been published.

GHÁZIABÁD, a town in Meerut district, Northwestern Provinces of India, distant twelve miles from Delhi and twenty-eight miles from Meerut. Population about 15,059.

GHAZIPUR, a city of India, capital of a district of the same name in the Northwest Provinces, stands on the left bank of the Ganges, forty-four miles northeast of Benares. The city, which stretches along the Ganges for about two miles, contains the ruins of the Palace of Forty Pillars, and a marble statue by Flaxman of Lord Cornwallis, who died here in 1805. Ghazipur is the headquarters of the Government Opium Department for the Northwest Provinces, all the opium from these provinces being manufactured here, and there is some trade in sugar, tobacco, rose-water and coarse long cloth. Population (1901), 53,232. The district,

of which Ghazipur is the administrative headquarters, has an area of 1,473 square miles, and a population of 1,014,099.

GHAZNI (also spelt GHIZNI and GHUZNEE), a fortified town of Afghanistan, stands below a spur of a range of hills at an elevation of 7,729 feet, eighty-four miles southwest of Kabul, on the road to Kandahar, at the head of the Gomal route to India. It is a place of considerable commercial importance, the climate is cold, snow often lying for three months in the year; nevertheless, wheat, barley and madder are grown in the vicinity. Its population is estimated at about 10,000. From the tenth to the twelfth century Ghazni was the capital of the empire of the Ghaznavids. It then fell into the hands of the sultan of Ghûr, and enjoyed a second period of splendor. Having shortly afterward been captured by the Mongols, it rapidly fell into decay. It remained however, subject to the descendants of Baber, the Mongol rulers of Delhi and Agra down to 1738, when it was taken by Nadir Shah of Persia, and at his death was incorporated in the kingdom of Afghanistan. During the nineteenth century it figured in the British wars against the Afghans, having been stormed by Lord Keane in 1839, and again in 1842 by the Afghans, but retaken the same year by General Nott. In the neighborhood of Ghazni there are several ruins and monuments of its former greatness, such as the tomb of Mahmud, Mahmud's dam in the Ghazni river, numerous ruin-heaps northeast of the town, and many Mohammedan shrines. The celebrated gates of Somnath were kept at Ghazni from 1024 to 1842.

GHEE, (Sanskrit, *Ghrita*), a kind of clarified butter made in the East. The best is prepared from butter of the milk of cows, the less esteemed from that of buffaloes. The butter is melted over a slow fire, and set aside to cool; the thick, opaque, whitish, and more fluid portion, or ghee, representing the greater bulk of the butter, is then removed. The less liquid residue, mixed with groundnut oil, is sold as an inferior kind of ghee. Old ghee is in special repute among the Hindus as a medicinal agent, and its efficacy as an external application is believed by them to increase with its age. Ghee more than ten years old, the *purâna ghrita* of Sanskrit materia medica, has a strong odor, and the color of lac. Some specimens which have been much longer preserved—and "clarified butter a hundred years old is often heard of"—have an earthy look, and are quite dry and hard, and nearly inodorous. Medicated ghee is made by warming ordinary ghee to remove contained water, melting, after the addition of a little turmeric juice, in a metal pan at a gentle heat, and then boiling with the prepared drugs till all moisture is expelled, and straining through a cloth.

GHEEL, or GEEL, a town of Belgium, in the province of Antwerp, about twenty-five miles east of Antwerp, on the railway between Herenthals and Moll, with a population of 12,265. Situated in the midst of that half barren stretch of moorland which is known as the Campine or Kampenland, it would have been of little importance, in spite of its manufactures of cloth, leather, wooden shoes and wax-lights, had it not for long centuries been the seat of a unique method of dealing with the insane. A local legend, tracing the origin of the town back to a chapel of St. Martin erected in the seventh century, goes on to tell how an Irish princess, fearing the fate that long afterward befel Beatrice Cenci, sought refuge in this remote asylum, but was pursued by her relentless father and put to death, along with a priest Gerrebert, the companion of her flight. The tomb of the victims was soon discovered to have a healing virtue for minds diseased; the sainted

Dymphna became the patroness of the insane; and a large and beautiful church in her honor was erected on the site of St. Martin's chapel. Commenced in the twelfth century, it was finished in 1340, and consecrated by the bishop of Cambray; and the pilgrimages to the tomb were sanctioned by a brief of Eugenius IV. In 1538 Jean de Mérode, within whose domains the church was situated, instituted a vicariate of nine priests and a director, and in 1562 Henri de Mérode transformed the vicariate into a regular chapter of nine canons and a dean. The church still remains to bear witness to the importance formerly attached to the shrine; and though the tomb of St. Dymphna has long been a cenotaph, a few stray enthusiasts still pass beneath it in hopeful imitation of the thousands in by-gone years, whose knees have worn deep furrows in the pavement as they made their ninefold transits on nine successive days. As food and lodging had to be provided for the patients who were brought to the saint, the inhabitants of Gheel grew accustomed to the treatment of the various kinds of mental alienation, and gradually discovered that forcible measures were much less frequently necessary, and danger less likely to result from free intercourse with the insane, than was generally believed throughout Europe. When M. Pontecoulant was appointed by Napoleon prefect of the Revolution department of the Dyle, his attention was called to the success of the domestic régime in force at Gheel, in contrast to the sad condition of affairs in the asylum at Brussels, and he caused the patients to be removed from the capital to the little country town. His example was freely followed by the authorities of different districts, and Gheel received full official recognition. Investigations undertaken about 1850 by M. Ducpétiaux, inspector-general of benevolent establishments in Belgium, resulted in the reform of such abuses as had crept into the system; and the relations of the patient and his protectors were placed on a strict legal footing by the law of May 1, 1851. Further ameliorations have been introduced in 1852, 1857, 1858, etc. The whole management of the system is under the supervision of officially appointed physicians, and the advantages of a regular establishment are thus combined with those of domestic comfort, social freedom and activity. Permission to receive patients is granted not only to the town residents, but also to the villagers of the vicinity. The support of the patients is in most cases guaranteed by the state.

GHEENT, a city of Belgium, at the head of the province of East Flanders, is situated about thirty miles to the west of Antwerp, on the Scheldt and the Lys. The two streams branch out to such an extent as to partition the town into twenty-six islands, which are connected by about two hundred and seventy bridges, forty-two being of stone, and twenty-eight of the others being wooden structures of considerable size. In general Ghent is well built, and, though the older portion has narrow and gloomy lanes, it occupies as a whole a larger area than most European towns in proportion to the population and the number of houses. A striking and pleasing feature is the number of promenades, the most noteworthy being the Coupure, or "Cutting," so called from the branch of the Bruges canal constructed in 1758.

The cathedral of St. Bavon ranks as one of the most splendid of the churches of Belgium. Though the original foundation dates from the ninth or tenth century, the crypt and choir of the actual edifice have no higher antiquity than the thirteenth century, and the other parts were not completed till the sixteenth. The church of St. Nicholas—an early Gothic structure, with a great tower of the fifteenth century and a modern portico—has the credit of being the oldest in the town;

and St. Michael's dating from about 1450, but frequently restored, is memorable as the scene of the worship of reason during the French Revolution.

Among the secular buildings of Ghent one of the finest is the Hôtel de Ville, its northern façade being an exceptionally rich example of flamboyant Gothic of the fifteenth century, and its eastern façade presenting a curious contrast, with its rows of Doric, Ionic, and Corinthian columns after the style of the Italian Renaissance. The court-house or palais de justice is a heavy but imposing structure in the Romanesque manner, erected between 1835 and 1843 by the architect Roelandt at the common expense of the state, the province, and the town.

With benevolent institutions of various kinds Ghent is abundantly supplied.

The spacious university buildings were erected between 1819 and 1826, at the expense of the city, under the auspices of William I., king of Holland. They were designed by Roelandt in the Greek style, and one of the principal features is a portico after the model of the Pantheon at Rome. The university library, containing upward of 100,000 volumes, and reckoned one of the most valuable in Belgium, was formerly the property of the town.

Though Ghent has no longer the industrial preëminence that it enjoyed in the fourteenth and fifteenth centuries, it is still the principal seat of the cotton and leather manufactures of Belgium. Flax-spinning, calico-printing, and sugar-refining are also extensively carried on, and there are engineering works, chemical works, iron-foundries, soap works, paper-mills, and breweries. The harbor, completed in 1828, is capable of accommodating 400 vessels, and vessels drawing seventeen feet of water can unload under the walls of the town. At Sas van Gend, fifteen miles north of the city, on the frontier of Holland, there are sluices by which the district can be laid under water.

In 1812 Ghent had no more than 55,161 inhabitants; by 1856 they had increased to 109,668, and by 1869 to 121,460. It has now (1901) a population of 160,949.

The investigations of local antiquaries leave it still doubtful whether Ghent had a Roman origin, as Petrarch supposed. That there was a military fortress on the spot in the seventh century, is proved by Baudemont's life of St. Amand, the first missionary of Christianity in the district. By the end of the thirteenth century Ghent was a greater city than Paris. In the fourteenth, under the leadership of the famous Jacob van Artevelde and his son Philip (1332-1382), it raised frequent insurrections against the counts of Flanders, and took a prominent part in the political movements of the Low Countries. At the commencement of the fifteenth century it had upward of 40,000 men employed in the woolen manufactures alone, and was able to place in the field from 18,000 to 20,000 men-of-arms. It was by the pacification of Ghent, signed in the town-hall November 8, 1578, that Holland and Zeeland, and the southern states of the Netherlands, formed an alliance against the Spanish supremacy, and three days after the Spanish garrison capitulated to the citizens. In 1584, however, the duke of Parma captured the town for Philip, and the citadel, which had been almost completely demolished, was restored. The attempts of the French in 1641 and 1642 to get possession of Ghent were frustrated by laying the country under water; but in 1678, though in the meanwhile the fortifications had been considerably extended, the feeble garrison under Don Francisco de Pardo was unable to defend the place against Marshals Humières, Luxembourg, Schomberg and Vauban. Ghent continued in French hands till the peace of Nimwegen. It played an important part in the war of the Spanish succession,

being captured in 1706 by Marlborough, recovered in 1708 by the French Marquis de Grimaldi, and again captured by Marlborough in 1709. In the war of the Austrian succession, Louis XIV. made his entry into the city July 25, 1745, and remained in possession till the treaty of Aix-la-Chapelle in 1748. By order of Joseph II., in 1781, the citadel and fortifications were dismantled, and the grounds on which they were built were sold. Under the régime of the French Revolution the city was made the chief town of the department of the Scheldt. By the peace of Paris (1814) it passed with Belgium to Holland; but it took an active part in the movement for the separation of the two kingdoms, and, after the separation was accomplished (1830), continued to be the headquarters of the agitation of the Orange party. In 1814 the treaty of peace between Great Britain and the United States was signed in Ghent.

GHEENT, JODOCUS, or JUSTUS, OF. The public records of the city of Ghent have been diligently searched, but in vain, for a clue to the history of Justus or Jodocus, whom Vasari and Guicciardini called Giusto da Guanto. Flemish annals of the sixteenth century have enlarged upon the scanty statements of Vasari, and described Jodocus as a pupil of Hubert Van Eyck. But there is no source to which this fable can be traced. The registers of St. Luke's guild at Ghent comprise six masters of the name of Joos or Jodocus who practiced at Ghent in the fifteenth century. But none of the works of these masters have been preserved, and it is impossible to compare their style with that of Giusto. It was between 1465 and 1474 that this artist executed the Communion of the Apostles which Vasari has described, and modern critics now see to the best advantage in the museum of Urbino. It was painted for the brotherhood of Corpus Christi at the bidding of Frederick of Montefeltro, who was introduced into the picture as the companion of Caterino Zeno, a Persian envoy at that time on a mission to the court of Urbino. From this curious production it may be seen that Giusto, far from being a pupil of Hubert Van Eyck, was merely a disciple of a later and less gifted master, who took to Italy some of the peculiarities of his native schools, and forthwith commingled them with those of his adopted country.

GHERARDESCA, UGO LINO DELLA, count of Donoratico, and head of the Gherardeschi, one of the leading Ghibelline houses of Pisa, began to take part in public affairs about the time when the dissensions which had arisen about the partition of Sardinia had resulted in sending over the entire clan of the Pisan Visconti to the Guelphs. In August, 1288, he was beset in the Palazzo del Popolo by the Ghibellines, and, after fire had been set to the building, taken prisoner, along with his sons, Gaddo and Ugoccione, and his grand-sons, Nino (surnamed Brigatto) and Anselmuccio. After having been confined for twenty days in the Palazzo del Comune, they were removed to the Gualandri's Tower, Alle Sette Vie, afterward called the Torre della Fame. Here they were kept till March, 1289, when, by order of the archbishop, the door was locked, and the keys thrown into the Arno. Nine days afterward the tower was re-entered, and the bodies removed to the church of San Francisco.

GHERIAH, a town and fortress of British India, in the presidency of Bombay, about 170 miles south of Bombay, otherwise called Viziadrag. See VIZIADRUG.

Ghibellines. See Guelphs.

GHIBERTI, LORENZO, whose name alone is worthy to rank with that of Donatello among the grand Italian sculptors of the Renaissance, was born at Florence in the year 1378. He learned the trade of a goldsmith under his father Ugoccione, commonly called

Cione, and his stepfather Bartoluccio. In the early stage of his artistic career, Ghiberti was best known as a painter in fresco, and when his native city Florence was visited by the plague he repaired to Rimini, where he executed a highly prized fresco in the palace of the sovereign Pandolfo Malatesta. He was recalled from Rimini to his native city by the urgent entreaties of his stepfather Bartoluccio, who informed him that a competition was to be opened for a design of a second bronze gate in the baptistery, and that he would do wisely to return to Florence and take part in this great artistic contest. The subject for the artists was prescribed—the Sacrifice of Isaac; and the competitors were required to observe in their work a certain conformity to the first bronze gate of the baptistery, executed by Andrea Pisano about 100 years previously. Of the six designs presented by different Italian artists, those of Donatello, Brunelleschi and Ghiberti, were pronounced the best, and of the three Brunelleschi's and Ghiberti's superior to the third, and of such equal merit that the thirty-four judges with whom the decision was left intrusted the execution of the work to the joint labor of the two friends. Brunelleschi, however, withdrew entirely from the contest—according to one account, from his cordial admiration of Ghiberti's genius; according to another, from his unwillingness to share so great an undertaking with any fellow-laborer. The first of his two bronze gates for the baptistery occupied Ghiberti twenty years, and when completed was justly regarded as the greatest work of its kind since the most glorious days of Grecian art. Ghiberti brought to his task a deep religious feeling and the striving after a high poetical ideal which are not to be found in the works of Donatello, though in power of characterization the second sculptor often stands above the first. Like Donatello, he seized every opportunity of studying the remains of ancient art; but he sought and found purer models for imitation than Donatello, through his excavations and studies in Rome, had been able to secure. The council of Florence, which met during the most active period of Ghiberti's artistic career, not only secured him the patronage of the pontiff, who took part in the council, but enabled him, through the important connections which he then formed with the Greek prelates and magnates assembled in Florence, to obtain from many quarters of the Byzantine empire the precious memorials of old Greek art, which he studied with untiring zeal. The unbounded admiration called forth by Ghiberti's first bronze gate led to his receiving from the chiefs of the Florentine guilds the order for the second, of which the subjects were likewise taken from the Old Testament. The Florentines gazed with especial pride on these magnificent creations, which must still have shone with all the brightness of their original gilding when, a century later, Michelangelo pronounced them worthy to be the gates of paradise. Next to the gates of the baptistery Ghiberti's chief works still in existence are his three statues of St. John the Baptist, St. Matthew, and St. Stephen, executed for the church of San Michele, among which three works, from the ideal character of the entire figure and the peculiar felicity of expression, the palm is generally awarded to the St. Stephen. In the bas-relief of the coffin of St. Zenobio, in the Florence cathedral, Ghiberti put forth much of his peculiar talent, and though he did not, as is commonly stated, execute entirely the painted glass windows in that edifice, he furnished several of the designs, and did the same service for a painted glass window in the church of San Michele. He died at the age of seventy-seven.

GHİKA, HELENA, Princess Koltzoff-Massalsky, better known by her literary pseudonym of Dora

d'Istria, was a daughter of Prince Michael Ghika, was niece of two Hospodars of Wallachia, and was born at Bucharest, January 22, 1829. The family from which she was descended was Albanian in origin, and, from the time of George Ghika, Hospodar of Wallachia, in 1660, gave many princes and eminent men to the principalities. Profoundly instructed in the classics under the care of George Pappadopoulos, the princess added to her acquirements by traveling through Germany, France, and Italy, an extensive knowledge of modern languages and literature. At fifteen she commenced a translation of the *Iliad* into German, and, not long after, wrote several pieces for the theater. On her unhappy marriage in 1849 with Prince Koltzoff-Massalsky, she accompanied her husband to the court of St. Petersburg; but from 1855 she resided mainly at Florence, where she died November 22, 1888. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published in 1855. Other works were: *La Suisse Allemande* (1856); *Les Femmes en Orient* (1860); *Excursions en Roumelie* (1863); *Aux Bords des Lacs Helvétiques* (1864); *Des Femmes par une Femme* (1864); *Gli Albanesi in Rumenia*; *Storia de Principi Ghika* (1873); *La Poesie des Ottomans* (1873); She wrote much for the *Revue des Deux Mondes*, and other journals and magazines of France, Italy, Belgium, and Switzerland; and her writings on Albanian literature stirred up a notable literary and national movement among the Albanians. She was made a member of several learned societies, and an honorary citizen of the Greek kingdom.

GHILAN, or GILAN, a province of Persia, lying along the southwest shore of the Caspian, separated from the Russian district of Talish by the Astara, and bounded west by Azerbaijan, south by Irak Adjemi, and southeast by Mazanderan. It is about 150 miles in length, with a breadth varying from fifteen to fifty miles; and its area is estimated at from 4,500 to 5,000 square miles. The greater portion of the province is a lowland region shut in by the mountains of the Elburz range; and though the Kyzyl Usen, which has its sources in the mountains of Kurdistan, is the only river of any size, the country is abundantly watered, and vast stretches of swamp are found in various directions. This is mainly due to the character of the climate, which is distinguished by a very heavy precipitation both in winter and summer. Vegetation is almost tropically luxuriant, and the forests are as dense as an Indian jungle. Oaks, maples, ash trees, *planeras*, lime trees, and *parrottias*, are among the prevailing types. The chestnut-leaved oak attains colossal proportions, and a height at times of 130 or 140 feet; and the box tree comes to rare perfection, and forms an important source of wealth. Vines and pomegranates, walnuts, plums, pears, and apples grow wild; and oranges, lemons, peaches, and other fruits are easily cultivated, though sometimes a severe winter proves fatal to the trees. Hitherto the most successful occupation has been silk-growing; but frequent failures in the crop have disheartened, if they have not ruined, many of the silk-masters. Animal life is nearly as well represented in Ghilan as vegetable life. Tigers, wild boars, deer, and a considerable variety of snakes are found in the jungles; pheasants are a common form of game; aquatic birds of various kinds—pelicans, storks, heron, gulls, ducks, etc., swarm along the coast; and the fisheries in the Caspian are highly productive. Wild horses are to be met with in the forests. A striking instance of the primitive state of matters is furnished by Mr. Mounsey, who tells how the machinery ordered by the Shah from Europe for his new mint was allowed to go to ruin in the sand at Enzelli, because it was found im-

possible to provide for its conveyance.

The administration of the province is nearly as primitive as its system of roads, and consists of nothing but machinery for the collection of the taxes, which yield about £63,000 to the royal revenue. The capital is Resht.

GHIRLANDAJO, DOMENICO DEL (1449-1494), an illustrious Florentine painter. The painter is generally termed Domenico Bigordi, but some authors give him, and apparently with reason, the paternal surname Curradi. Ghirlandajo (garland-maker) was only a nickname, coming to Domenico from the employment of his father (or else of his earliest instructor), who was renowned for fashioning the metallic garlands worn by Florentine damsels; he was not, however, as some have said, the inventor of them. His youthful years were entirely undistinguished, and at the age of thirty-one he had not a fixed abode of his own. This is remarkable, as immediately afterward, from 1480 onward to his death at a comparatively early age, in 1494, he became the most proficient painter of his time, incessantly employed, and condensing into that brief period of fourteen years fully as large an amount of excellent work as any other artist that could be named; indeed, we should properly say eleven years, for nothing of his is known of a later date than 1491.

In general artistic attainment Ghirlandajo may fairly be regarded as exceeding all his precursors or competitors; though the names of a few, particularly Giotto, Masaccio, Lippo Lippi, and Botticelli, stand higher for originating power. His scheme of composition is grand and decorous; his chiaroscuro excellent, and especially his perspectives, which he would design on a very elaborate scale by the eye alone; his color is more open to criticism, but this remark applies much less to the frescos than the tempera-pictures, which are sometimes too broadly and crudely bright.

GHIRLANDAJO, RIDOLFO, son of Domenico, was also a painter of considerable celebrity. Born on February 14, 1483, and being thus less than eleven years old when his father died, he was brought up by his uncle David. To this second-rate artist he owed less in the way of professional training than to Granacci, Piero di Cosimo, and perhaps Cosimo Roselli. It has been said that Ridolfo studied also under Fra Bartolommeo, but this is not clearly ascertained. He was certainly one of the earliest students of the famous cartoons of Leonardo da Vinci and Michelangelo. He was prominent in the execution of vast scenic canvases for various public occasions, such as the Wedding of Giuliano de' Medici, and the Entry of Leo. X. into Florence in 1515. In his prime he was honest and conscientious as an artist; but from about 1527 he declined, having already accumulated a handsome property, more than sufficient for maintaining in affluence his large family of fifteen children, and his works became comparatively mannered and self-repeating.

GHIZNI. See **GHAZNI**.

GHOORKAS. See **NEPAL**.

GHOST-MOTH (*Hepialus humuli*), a species of moth very common in many parts of Britain, of which the caterpillar, popularly known as the "Otter," often commits great ravages in hop gardens, devouring the roots of the plants. It feeds also on the roots of the nettle, burdock and some other plants. The moth belongs to a small family (*Hepalidæ*), often popularly called "Swifts" from their rapid flight. The antennæ are short, the wings long and narrow, the entire size about two inches across. The male is entirely of a satiny white color above, and the female yellowish and reddish, with darker markings; both sexes are brown on the under side. They are to be seen flying about in the

twilight, generally over lawns and pastures, not infrequently in church yards. From this circumstance, and from the white color of the males and their sudden disappearance in the imperfect light on their folding their wings or rising above the level of the spectator's eye (so that the brown part is turned toward him), they derive their name. The caterpillar, which is sometimes two inches long, is yellowish white with scattered hairs. It spins a large cylindrical cocoon among the roots on which it has been feeding, and then becomes a chrysalis. Two other common species of generally similar habit are *H. lupulinus* and *H. hectus*.

GHUR is the name of a territory in Asia, and **GHŪRI** that of a dynasty deriving its origin from that territory.

The name of Ghūr was, in the Middle Ages, and, indeed, locally still is, applied to the highlands east of Herat, and extending eastward to the upper Helmand valley, or nearly so. There is hardly any region of Asia regarding which we continue to be more in the dark than about this. Ghūr is the southern portion of that great peninsula of strong mountain country which forms the western part of modern Afghanistan, and which may be taken, in a general way, to represent the Paropamisus of the ancients. The northern portion of the said peninsula was, in the Middle Ages, comprehended under the names of *Gharjistan* (on the west), and *Furjānā* (on the east), while the basin of the Herat river, and all south of it, constitute Ghūr. The name as now used does not, perhaps, include the valley of the Herat river; on the south the limit seems to be the declivity of the higher mountains dominating the descent to the lower Helmand, and the road from Farrah to Kandahar. It is in Ghūr that rise all those affluents of the closed basin of Seistán, the Harūt the Farrah-rūd, the Khāsh-rūd (see **AFGHANISTAN**), besides other considerable streams joining the Helmand above Girishk.

Ghūr is mentioned in the Shahnamah of Firdousi (1010 A.D.), and in the Arab geographers of that time, though these latter fail in details almost as much as we moderns, thus indicating how little accessible the country has been through all ages.

GIAMBELLI, or **GIANIBELLI**, **FEDERIGO**, a military engineer, was born at Mantua about the middle of the sixteenth century. Having had some experience as a military engineer in Italy, he went to Spain to offer his services to Philip II. His proposals were, however, somewhat lukewarmly received, and as he could obtain from the king no immediate employment, he took up his residence at Antwerp, where he soon gained considerable reputation for his knowledge in various departments of science. He is said to have vowed to be revenged for his rebuff at the Spanish court; and when Antwerp was besieged by the duke of Parma in 1584, he put himself in communication with Queen Elizabeth, who having satisfied herself of his abilities, engaged him to aid by his counsels in its defense. His plans for provisioning the town were rejected by the senate, but they agreed to a modification of his scheme for destroying the famous bridge which closed the entrance to the town from the side of the sea, by the conversion of two ships of sixty and seventy tons into infernal machines. One of these exploded, and, besides destroying more than 1,000 soldiers, effected a breach in the structure of more than 206 feet in width, by which, but for the hesitation of Admiral Jacobzoon, the town might at once have been relieved. After the surrender of Antwerp Giambelli went to England, where he was engaged for some time in fortifying the river Thames; and when the Spanish Armada was attacked by fire-ships in the Calais roads, the panic which ensued was due to the conviction among the Spaniards that the fire-ships were infernal machines constructed by Giambelli. He is

said to have died in London, but the year of his death is unknown.

GIANNONE, PIETRO, the most distinguished historian of whom Naples can boast, and among all Italian historians second alone to Fra Paolo Sarpi for the strong and clear light thrown in his works on the growth of the papal power, was born at Ischitella, in the province of Capitanata, on May 7, 1676. Arriving in Naples at the age of eighteen, he devoted himself to the study of law, but his legal pursuits were much surpassed in importance by his literary labors. He devoted twenty years to the composition of his great work, *The Civil History of Naples*, which was ultimately published in 1723. He was on account of his position in regard to the papacy, compelled to flee to Austria, where he was received with favor and given a pension. On the transfer of the Neapolitan crown to Charles of Bourbon, Giannone lost his Austrian pension, and was compelled to remove to Venice. There he was at first most favorably received. The post of consulting lawyer to the republic, in which he might have continued the special work of Fra Paolo Sarpi, was offered to him, as well as that of professor of public law in Padua; but he declined both offers. Unhappily there arose a suspicion that his views on maritime law were not favorable to the pretensions of Venice, and, notwithstanding all his efforts to dissipate that suspicion, it was resolved to expel him from the state. On September 23, 1735, he was seized and conveyed to Ferrara. After wandering, under the assumed name of Antonio Rinaldo, for three months through Modena, Milan, and Turin, he at last reached Geneva, where he enjoyed the friendship of the most distinguished citizens, and was on excellent terms with the great publishing firms. But in an evil hour he was induced to visit a Catholic village within the Sardinian territory, where he was kidnapped by the agents of the Sardinian Government, conveyed to the castle of Miolan, and thence successively transferred to Ceva and Turin. In the fortress of Turin he remained immured during the last twelve years of his life, though part of his time was spent in composing a defense of the Sardinian interests as opposed to those of the papal court, and though he was led to sign a retraction of the statements in his history most obnoxious to the Vatican. He died March 7, 1748, in his seventy-second year.

GIANT is the Old English *geant*, derived through French and Latin from Greek *gigas* (*gigant*). The idea conveyed by the word in classic mythology is that of beings more or less manlike, but monstrous in size and strength. Figures like the Titans and the Giants whose birth from Heaven and Earth is sung by Hesiod in the *Theogony*, such as can heap up mountains to scale the sky, and war beside or against the gods, must be treated, with other like monstrous figures of the wonder-tales of the world, as belonging altogether to the realms of mythology. But there also appear in the legends of giants some with historic significance. The Bible (the English reader must be cautioned that the word giant has been there used ambiguously, from the Septuagint downward) touches the present matter in so far as it records the traditions of the Israelites of fighting in Palestine with tall races of the land such as the Anakim. When reading in Homer of "the Cyclopes and the wild tribes of the Giants," or of the adventures of Odysseus in the cave of Polyphemus, we seem to come into view of dim traditions, exaggerated through the mist of ages, of pre-Hellenic barbarians, godless, cannibal, skin-clothed, hurling huge stones in their rude warfare. Giant-legends of this class are common in Europe and Asia, where the big and stupid giants have often every token of uncouth native barbarians, exagger-

ated into monsters in the legends of the later tribes who dispossessed and slew them.

Besides the conception of giants as special races distinct from mankind, it was a common opinion of the ancients that the human race had itself degenerated, the men of primeval ages having been of so far greater stature and strength as to be in fact gigantic. This, for example, is received by Pliny, and it becomes a common doctrine of theologians such as Augustine, lasting on into times so modern that it may be found in Cruden's *Concordance*. Yet, so far as can be judged from actual remains, it does not appear that giants, in the sense of tribes of altogether superhuman stature, ever existed, or that the men of ancient time were on the whole taller than those now living. It is now usual to apply the word giant to beings not superhuman in their height, but merely the tallest men and women of our nations. In every race of mankind the great mass of individuals do not depart far from a certain mean or average height, while the very tall or very short men become less and less numerous as they depart from the mean standard, till the utmost divergence is reached in a very few giants on the one hand, and a very few dwarfs on the other. At both ends of the scale, the body is markedly out of the ordinary proportions; thus a giant's head is smaller and a dwarf's head larger than it would be if an average man had been magnified or diminished. Quetelet considers the tallest man whose stature has been authentically recorded to have been Frederick the Great's Scottish giant, who was not quite eight feet three inches. Modern statisticians, though admitting that this may not be the extreme limit of human stature, cannot accept the loose conclusion in Buffon, that there is no doubt of giants having been ten, twelve and perhaps fifteen feet high. Confidence is not even to be placed in ancient asserted measurements, as where Pliny gives to one Gabbaras, an Arabian, the stature of nine feet nine inches (about nine feet five and a half inches English), capping this with the mention of Posio and Secundilla, who were half a foot higher. That two persons should be described as having this same extraordinary measure suggests to the modern critic the notion of a note jotted down on the philosopher's tablets, and never tested afterward.

GIANT'S CAUSEWAY (deriving its name from a legend that it was the commencement of a road to be constructed by giants across the channel to Scotland) is a sort of natural pier or mole, of columnar basalt, projecting from the northern coast of Antrim, Ireland, into the North Channel, seven miles northeast of Portrush, by an electric tramway (1883). It is part of an overlying mass of basalt, from 300 to 500 feet in thickness, which covers almost the whole county of Antrim, and the eastern part of Londonderry. The basalt occurs in several beds, interstratified with protrusions of whin-dyke. Several of these beds are more or less columnar, but three layers are remarkably so. The first appears at the bold promontory of Fair Head; its columns exceed 200 feet in height. The other two are seen together rising above the sea level at Bengore Head, the lower one forming the Giant's Causeway. It is exposed for 300 yards, and exhibits an unequal pavement, formed of the tops of 40,000 vertical closely-fitting polygonal columns, which in shape are chiefly hexagonal, though examples may be found with five, seven, eight or nine sides. There is a single instance of a triangular prism. The diameter of the pillars varies from fifteen to twenty inches. Each pillar is divided into joints of unequal length, the concave hollow at the end of one division fitting exactly into the convex projection of the other. The rock is compact and homogeneous, and is somewhat sonorous when

struck with a hammer. The Grand Causeway is itself formed of three causeways, the Little, Middle, or Honeycomb, and the Grand Causeway. On the Little Causeway may be seen an octagon, pentagon, hexagon, and heptagon all together; on the Middle Causeway is the famous Wishing Chair, with two arms and a back, on a platform where the columns rise to a height of about ten feet. On the Grand Causeway are pointed out the Lady's Fan, an exact arrangement of five perfect pentagons surrounding a heptagon; the keystone of the Causeway—a sunk octagon; and the single triangle. At the starting point is the Giant's Loom, an imposing row of columns thirty feet high, each intersected by about thirty joints; to the left is the Giant's Well, to the right the Giant's Chair.

The best way to see the Causeway is to walk along it under the cliffs, and next over them, but he who would see the full grandeur of this wonderful strip of coast must row along it eastward as far as the Pleaskin. The "short course" includes a visit to Portcoon and Runkerry Caves and the Causeway only; the "long course" extends westward to the caves, and eastward to the Horseshoe Bay, beyond Pleaskin and under Benbane Head. The various inlets and points along the coast, passed in order, are Portnabo, separated by the Stookan Rocks from Portgannai; next after the Giant's Causeway proper is passed, Portnoffer, closed on the east side by the Giant's Organ, a row of imposing pillars, the appearance of which at once explains their name; after Roverin Valley Head is turned, Port Reostan, opening up into the amphitheater, fringed with cliffs 350 feet high and reaching its eastern horn in the Chimney Point, the lofty stacks of whose rocks are said to have been fatally mistaken for the chimneys of Dunluce Castle by a Spanish Armada ship. The next bay is Spanish Bay, with the Spanish Organ, shut in by Benanouran Head, 400 feet high, between which and Pleaskin Head are the reefs called the Giant's Eyeglass and the King and his Nobles. The Pleaskin rises to a height of 400 feet, and is the noblest of all the Causeway cliffs. The prospect is unrivaled from Hamilton's Seat near its top, so named from the Rev. Doctor Hamilton of Derry, one of the first to discover the Causeway (1786). Beyond it is the Horseshoe Harbor and the group of rocks called the Nurse and Child. After rounding Benbane Head we come in sight of Bengore Head (367 feet), below which the coast slopes more rapidly southward past the pillars known as the Four Sisters, the Giant's Peep-hole, and the Giant's Granny, to the ruins of Dunseverick Castle.

GIANTS' KETTLES, the name given in Norway to vertical, pot-shaped, smooth-sided hollows excavated in rocks, usually filled up with rounded boulders, water-worn stones, gravel, and other detritus. They are believed to have originated under the great glaciers or continuous *mer de glace*, which formerly covered wide regions of northern Europe. They have probably been formed by water descending from the surface of the ice through *moulins* or glacial chimneys, setting stones and boulders in rapid rotation. They are thus comparable to the pot-holes which are so common a feature in the beds of rapid streams, particularly in the neighborhood of waterfalls where the stones have a gyratory motion imparted to them by the irregular movements of the water. As they rotate they gradually wear away the rock, and produce more or less steep-sided cavities. Giants' kettles occur in connection with the glacial deposits of many other countries besides Norway, as, for example, in Prussia.

GIARRE, a town of Sicily, in the province of Catania, between Etna and the sea, with a station on the railway from Messina to Catania, distant from the

former forty miles, and from the latter nearly nineteen.

GIAVENO, a market-town of Italy, in the province of Turin, and circondario of Susa, about sixteen miles west of Turin, at the foot of the Cottian Alps, and on the left bank of the Sangone, a headwater of the Po.

GIB, ADAM, the leader of the Antiburgher section of the Scottish Secession Church, was born 1714, in the parish of Muckhart, Perthshire, and, on the completion of his literary and theological studies at Edinburgh and Perth, was licensed as a preacher in 1740. In the following year he was ordained minister of the large Secession congregation of Bristo, Edinburgh, being the first in the city inducted into such a charge; and there his powerful intellect and his intensity of character soon secured for him a position of considerable prominence. In 1742 he caused some stir by the publication of an invective entitled *A warning against countenancing the ministrations of Mr. George Whitefield*; and in 1745 he was almost the only minister of Edinburgh who continued to preach, and to preach against rebellion, while the troops of Charles Edward were in occupation of the town. When, in 1747, "the Associate Synod," by a narrow majority, decided not to give full immediate effect to a judgment which had been passed in the previous year against the lawfulness of the "Burgess Oath," Gib led the protesting minority, who forthwith separated from their brethren and formed the Antiburgher Synod. It was chiefly under his influence that it was agreed by this ecclesiastical body at subsequent meetings to summon to the bar their "Burgher" brethren, and finally to depose and excommunicate them for contumacy. In 1765 he made a vigorous and able reply to the General Assembly of the Church of Scotland, which had stigmatized the Secession as "threatening the peace of the country;" and this apology was further developed in his *Display of the Secession Testimony*, published in 1774. From 1753 (when after protracted litigation he was compelled to leave the Bristo church) till within a short period of his death, which took place June 18, 1788, he preached regularly in Nicolson Street church, which is said to have been filled every Sunday with an audience of 2,000 persons.

GIBBON (*Hylobates*), a genus of tailless anthropoid apes, natives of the East Indies. They are nearly allied to the oranges and chimpanzees, but are of more slender form, and their arms are so long as almost to reach the ground when they are placed in an erect posture; there are also naked collosities on the buttocks. In this respect they differ from the other anthropoid apes, and are allied to some of the catarrhini; in other respects also the gibbons are the lowest among the anthropoid apes, and connect them with the catarrhini. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with extreme agility. They cannot, however, move with ease or rapidity on the ground. The conformation of the hinder extremities adds to their difficulty in this, while it increases their adaptation to a life among the branches of trees, the soles of the feet being much turned inward. None of the gibbons are of a large size. There are some eight or ten species. The common gibbon or Lar gibbon (*H. lar*) is found in some parts of India, and in more eastern regions. The active gibbon (*H. agilis*), found in Sumatra, is particularly remarkable for the power which it displays of flinging itself from one tree to another, clearing at once, it is said, a distance of forty feet. The Wow-wow (*H. leuciscus*) is a gibbon found in Malacca and the Sundy Isles. *H. leucogenys* is from Siam. The Hoolock (*H. Hoolock*) is a native of the Garro Hills. The Siamang (*H. Syndac*

tylus), a Sumatran species, differs from the rest of the genus in having the first and second fingers of the hinder extremities united together up to the second joint; it resembles the orang and differs from the true gibbons in having a large air sac opening into the windpipe. All the gibbons are of gentle disposition and easily domesticated. At present the gibbons are confined to south-eastern Asia and some of the larger islands bordering upon the continent, but it is possible that *Dryopithecus* found fossil in tertiary strata of the south of France, of the size of a man, is referable to the same group.

GIBBON, EDWARD, one of the most celebrated historians of any age or country, was also his own historian. He has left us one of the most piquant autobiographies ever written.

The historian was born at Putney, Surrey, April 27 (Old Style), 1737. His mother, Judith Porten, was the daughter of a London merchant. He was the eldest of a family of six sons and a daughter, and the only one who survived childhood; his own life in youth hung by so mere a thread as to be again and again despaired of. His mother, between domestic cares and constant infirmities (which, however, did not prevent an occasional plunge into fashionable dissipation in compliance with her husband's wishes), did but little for him. The "true mother of his mind as well as of his health" was a maiden aunt—Catherine Porten by name—with respect to whom he expressed himself in language of the most grateful remembrance.

In his ninth year (1746), during a "lucid interval of comparative health," he was sent to a school at Kingston-upon-Thames; but his former infirmities soon returned, and his progress, by his own confession, was slow and unsatisfactory. "By the common methods of discipline, at the expense of many tears and some blood, I purchased the knowledge of the Latin syntax," but manifestly, in his own opinion, the *Arabian Nights*, Pope's *Homer*, and Dryden's *Virgil*, eagerly read, had at this period exercised a much more powerful influence on his intellectual development than Phædrus and Cornelius Nepos, "painfully construed and darkly understood."

In December, 1747, his mother died, and he was taken home. After a short time his father removed to the "rustic solitude" of Buriton (Hants), but young Gibbon lived chiefly at the house of his maternal grandfather, at Putney, where, under the care of his devoted aunt, he developed, he tells us, that passionate love of reading "which he would not exchange for all the treasures of India," and where his mind received its most decided stimulus. In 1749, in his twelfth year, he was sent to Westminster, still residing, however, with his aunt, who, rendered destitute by her father's bankruptcy, but unwilling to live a life of dependence, had opened a boarding-house for Westminster school. Here in the course of two years (1749–50), interrupted by danger and debility, he "painfully climbed into the third form;" but it was left to his riper age to "acquire the beauties of the Latin and the rudiments of the Greek tongue." The continual attacks of sickness which had retarded his progress induced his aunt, by medical advice, to take him to Bath; but the mineral waters had no effect. He then resided for a time in the house of a physician at Winchester; the physician did as little as the mineral waters; and, after a further trial of Bath, he once more returned to Putney, and made a last futile attempt to study at Westminster. Finally, it was concluded that he would never be able to encounter the discipline of a school; and casual instructors, at various times and places, were provided for him. Meanwhile his indiscriminate appetite for reading had begun to fix itself more and more decidedly upon history; and the

list of historical works devoured by him during this period of chronic ill-health is simply astonishing. His first introduction to the historic scenes, the study of which afterward formed the passion of his life, took place in 1751, when, while along with his father visiting a friend in Wiltshire, he discovered in the library "a common book, the continuation of Echard's *Roman History*." "To me the reigns of the successors of Constantine were absolutely new; and I was immersed in the passage of the Goths over the Danube, when the summons of the dinner-bell reluctantly dragged me from my intellectual feast." Soon afterward his fancy kindled with the first glimpses into Oriental history, the wild "barbaric" charm of which he never ceased to feel. Ockley's book on the Saracens "first opened his eyes" to the striking career of Mahomet and his hordes; and with his characteristic ardor of literary research, after exhausting all that could be learned in English of the Arabs and Persians, the Tartars and Turks, he forthwith plunged into the French of D'Herbelot, and the Latin of Pocock's version of Abulfaragius, sometimes understanding them, but oftener only guessing their meaning.

Toward his sixteenth year he tells us "nature displayed in his favor her mysterious energies," and all his infirmities suddenly vanished. Thenceforward, while never possessing or abusing the insolence of health, he could say, "few persons have been more exempt from real or imaginary ills." His unexpected recovery revived his father's hopes for his education, hitherto so much neglected if judged by ordinary standards; and, accordingly in January, 1752, he was placed at Esher, Surrey, under the care of Doctor Francis, the well-known translator of Horace. But Gibbon's friends in a few weeks discovered that the new tutor preferred the pleasures of London to the instruction of his pupils, and in this perplexity decided to send him prematurely to Oxford, where he was matriculated as a gentleman commoner of Magdalen College, April 3, 1752. According to his own testimony, he arrived at the university "with a stock of information which might have puzzled a doctor, and a degree of ignorance of which a school-boy might be ashamed." And indeed his huge wallet of scraps stood him in little stead at the trim banquets to which he was invited at Oxford, while the wandering habits by which he had filled it absolutely unfitted him to be a guest. He was not well grounded in any of the elementary branches, which are essential to university studies, and to all success in their prosecution. It was natural, therefore, that he should dislike the university, and as natural that the university should dislike him. Many of his complaints of the system were perfectly just; but it may be doubted whether any university system would have been profitable to him, considering his antecedents. He complains especially of his tutors, and in one case with abundant reason; but, by his own confession, they might have recriminated with justice, for he indulged in gay society, and kept late hours. His observations, however, on the defects of the English university system, some of which have only very recently been removed, are acute and well worth pondering, however little relevant to his own case. He remained at Magdalen about fourteen months. "To the university of Oxford," he says, "I acknowledge no obligation; and she will as cheerfully renounce me for a son as I am willing to disclaim her for a mother. I spent fourteen months at Magdalen College; they proved the fourteen months the most idle and unprofitable of my whole life."

But thus "idle" though he may have been as a "student," he already meditated authorship. In the first long vacation—during which he, doubtless with some

sarcasm, says that "his taste for books began to revive"—he contemplated a treatise on the age of Sesostris, in which (and it was characteristic) his chief object was to investigate not so much the events as the probable epoch of the reign of that semi-mythical monarch, whom he was inclined to regard as having been contemporary with Solomon. "Unprovided with original learning, unformed in the habits of thinking, unskilled in the arts of composition, I resolved to write a book;" but the discovery of his own weakness, he adds, was the first symptom of taste. On his first return to Oxford the work was "wisely relinquished," and never afterward resumed. The most memorable incident, however, in Gibbon's stay at Oxford was his temporary conversion to the doctrines of the church of Rome. The bold criticism of Middleton's recently (1749) published *Free Enquiry into the Miraculous Powers which are supposed to have subsisted in the Christian Church*, appears to have given the first shock to his Protestantism, not indeed by destroying his previous belief that the gift of miraculous powers had continued to subsist in the church during the first four or five centuries of Christianity, but by convincing him that within the same period most of the leading doctrines of popery had been already introduced both in theory and in practice. At this stage he was introduced by a friend (Mr. Molesworth) to Bossuet's *Variations of Protestantism, and Exposition of Catholic Doctrine*. "These works," says he, "achieved my conversion, and I surely fell by a noble hand." In bringing about this "fall," however, Parsons, the Jesuit appears to have had a considerable share; at least Lord Sheffield has recorded that on the only occasion on which Gibbon talked with him on the subject he imputed the change in his religious views principally to that vigorous writer, who, in his opinion, had urged all the best arguments in favor of Roman Catholicism. But be this as it may, he had no sooner adopted his new creed than he resolved to profess it; "a momentary glow of enthusiasm" had raised him above all temporal considerations, and accordingly, on June 8, 1753, he records that having "privately abjured the heresies" of his childhood before a Catholic priest of the name of Baker, a Jesuit, in London, he announced the same to his father in an elaborate controversial epistle which his spiritual adviser much approved, and which he himself afterward described to Lord Sheffield as having been "written with all the pomp, the dignity, and self-satisfaction of a martyr."

The elder Gibbon heard with indignant surprise of this act of juvenile apostasy, and, indiscreetly giving vent to his wrath, precipitated the expulsion of his son from Oxford, a punishment which the culprit, in after years at least, found no cause to deplore. That his conversion was sincere at the time, that it marked a real if but a transitory phase of genuine religious conviction, we have no reason to doubt, notwithstanding the skepticism he has himself expressed. Nor is the sincerity of the Catholicism he professed in these boyish days in any way discredited by the fact of his subsequent lack of religion. Indeed, as one of the acutest and most sympathetic of his critics has remarked, the deep and settled grudge he has betrayed toward every form of Christian belief, in all the writings of his maturity, may be taken as evidence that he had at one time experienced in his own person at least some of the painful workings of a positive faith.

But little time was lost by the elder Gibbon in the formation of a new plan of education for his son, and in devising some method which if possible might effect the cure of his "spiritual malady." The result of deliberation, aided by the advice and experience of

Lord Eliot, was that it was almost immediately decided to fix Gibbon for some years abroad under the roof of M. Pavilliard, a Calvinist minister at Lausanne. In as far as regards the instructor and guide thus selected, a more fortunate choice could scarcely have been made. From the testimony of his pupil, and the still more conclusive evidence of his own correspondence with the father, Pavilliard seems to have been a man of singular good sense, temper and tact. At the outset, indeed, there was one considerable obstacle to the free intercourse of tutor and pupil: M. Pavilliard appears to have known little of English, and young Gibbon knew practically nothing of French. But this difficulty was soon removed by the pupil's diligence; the very exigencies of his situation were of service to him in calling forth all his powers, and he studied the language with such success that at the close of his five years' exile he declares that he "spontaneously thought" in French rather than in English, and that it had become more familiar to "ear, tongue and pen." It is well known that in after years he had doubts whether he should not compose his great work in French; and it is certain that his familiarity with that language, in spite of considerable efforts to counteract its effects, tinged his style to the last.

Under the judicious regulations of his new tutor a methodical course of reading was marked out, and most ardently prosecuted; the pupil's progress was proportionately rapid. With the systematic study of the Latin, and to a slight extent also of the Greek classics, he conjoined that of logic in the prolix system of Crousaz; and he further invigorated his reasoning powers, as well as enlarged his knowledge of metaphysics and jurisprudence, by the perusal of Locke, Grotius, and Montesquieu. He also read largely, though somewhat indiscriminately, in French literature, and appears to have been particularly struck with Pascal's *Provincial Letters*, which he tells us he reperused almost every year of his subsequent life with new pleasure and which he particularly mentions as having been, along with Bletier's *Life of Julian* and Giannone's *History of Naples*, a book which probably contributed in a special sense to form the historian of the Roman empire.

Under the new influences which were brought to bear on him, he in less than two years resumed his Protestantism. "He is willing," he says, to allow M. Pavilliard a "handsome share in his reconversion," though he maintains, and no doubt rightly, that it was principally due "to his own solitary reflections." He particularly congratulated himself on having discovered the "philosophical argument" against transubstantiation, "that the text of Scripture which seems to inculcate the real presence is attested only by a single sense—our sight, while the real presence itself is disproved by three of our senses—the sight, the touch, and the taste." Before a similar mode of reasoning, all the other distinctive articles of the Romish creed "disappeared like a dream;" and "after a full conviction," on Christmas day, 1754, he received the sacrament in the church of Lausanne.

With all his devotion to study at Lausanne (he read ten or twelve hours a day), he still found some time for the acquisition of some of the lighter accomplishments, such as riding, dancing, drawing, and also for mingling in such society as the place had to offer. The last eighteen months of his residence abroad saw the infusion of two new elements—one of them at least of considerable importance—into his life. In 1757 Voltaire came to reside at Lausanne; and although he took but little notice of the young Englishman of twenty, who eagerly sought and easily obtained an introduction, the estab-

lishment of the theater at Monrepos, where the brilliant versifier himself declaimed before select audiences his own productions on the stage, had no small influence in fortifying Gibbon's taste for the French theater, and in at the same time abating that "idolatry for the gigantic genius of Shakespeare which is inculcated from our infancy as the first duty of an Englishman." In the same year—apparently about June—he saw for the first time, and forthwith loved, the beautiful, intelligent, and accomplished Mademoiselle Susan Curchod, daughter of the pasteur of Crassier. That the passion which she inspired in him was tender, pure, and fitted to raise to a higher level a nature which in some respects was much in need of such elevation will be doubted by none but the hopelessly cynical; and probably there are few readers who can peruse the paragraph in which Gibbon "approaches the delicate subject of early love" without discerning in it a pathos much deeper than that of which the writer was himself aware. During the remainder of his residence at Lausanne he had good reason to "indulge his dream of felicity;" but on his return to England, "I soon discovered that my father would not hear of this strange alliance, and that without his consent I was myself destitute and helpless. After a painful struggle I yielded to my fate; I sighed as a lover, I obeyed as a son; my wound was insensibly healed by time, absence, and the habits of a new life."

In 1758 he returned with mingled joy and regret to England, and was kindly received at home. But he found a stepmother there; and this apparition on his father's hearth at first rather appalled him. The cordial and gentle manners of Mrs. Gibbon, however, and her unremitting care for his happiness, won from him his first prejudices, and gave her a permanent place in his esteem and affection.

His father's library, though large in comparison with that he commanded at Lausanne, contained, he says, "much trash;" but a gradual process of reconstruction transformed it at length into that "numerous and select" library which was "the foundation of his works, and the best comfort of his life both at home and abroad." No sooner had he returned home than he began the work of accumulation, and records that, on the receipt of his first quarter's allowance, a large share was appropriated to his literary wants. It may not be uninteresting here to note the principles which guided him both now and afterward in his literary purchases. "I am not conscious," says he, "of having ever bought a book from a motive of ostentation; every volume, before it was deposited on the shelf, was either read or sufficiently examined;" he also mentions that he soon adopted the tolerating maxim of the elder Pliny, that no book is ever so bad as to be absolutely good for nothing.

In 1761 Gibbon, at the age of twenty-four, after many delays, and with many flutterings of hope and fear, gave to the world, in French, his maiden publication, an *Essai sur l'Étude de la Littérature*, which he had composed two years before. It was published partly in compliance with his father's wishes, who thought that the proof of some literary talent might introduce him favorably to public notice, and secure the recommendation of his friends for some appointment in connection with the mission of the English plenipotentiaries to the congress at Augsburg which was at that time in contemplation. But, in yielding to paternal authority, Gibbon frankly owns that he "complied, like a piousson, with the wish of his own heart."

The subject of this youthful effort was suggested, its author says, by a refinement of vanity—"the desire of justifying and praising the object of a favorite pursuit," namely, the study of ancient literature. Partly owing to its being written in French, partly to its character,

the *Essai* excited more attention abroad than at home. Gibbon has criticised it with the utmost frankness, not to say severity; but, after every abatement, it is unquestionably a surprising effort for a mind so young, and contains many thoughts which would not have disgraced a thinker or a scholar of much maturer age.

Some time before the publication of the essay, Gibbon had entered a new, and, one might suppose, a very uncongenial scene of life. In an hour of patriotic ardor he became (June 12, 1759) a captain in the Hampshire militia, and for more than two years (May 10, 1760, to December 23, 1763) led a wandering life of "military servitude." Hampshire, Kent, Wiltshire, and Dorsetshire formed the successive theaters of what he calls his "bloodless and inglorious campaigns." He complains of the busy idleness in which his time was spent; but, considering the circumstances, so adverse to study, one is rather surprised that the military student should have done so much, than that he did so little; and never probably before were so many hours of literary study spent in a tent. In estimating the comparative advantages and disadvantages of this wearisome period of his life, he has summed up with the impartiality of a philosopher and the sagacity of a man of the world.

It was during this period that he read Homer and Longinus, having for the first time acquired some real mastery of Greek; and after the publication of the *Essai*, his mind was full of projects for a new literary effort. The Italian expedition of Charles VIII. of France, the crusade of Richard I., the wars of the barons, the lives and comparisons of Henry V. and the emperor Titus, the history of the Black Prince, the life of Sir Philip Sydney, that of Montrose, and finally that of Sir W. Raleigh, were all of them seriously contemplated and successively rejected. By their number they show how strong was the impulse to literature, and by their character, how determined the bent of his mind in the direction of history; while their variety makes it manifest also that he had then at least no special purpose to serve, no preconceived theory to support, no particular prejudice or belief to overthrow.

The militia was disbanded in 1762, and Gibbon joyfully shook off his bonds; but his literary projects were still to be postponed. Following his own wishes, though with his father's consent, he had early in 1760 projected a continental tour as his completion "of an English gentleman's education." This had been interrupted by the episode of the militia; now, however, he resumed his purpose, and left England in January, 1763. Two years were "loosely defined as the term of his absence," which he exceeded by half a year—returning June, 1765. He first visited Paris, where he saw a good deal of D'Alembert, Diderot, Barthélemy, Raynal, Helvétius, Baron d'Holbach, and others of that circle, and was often a welcome guest in the saloons of Madame Geoffrin and Madame du Deffand. Voltaire was at Geneva, Rousseau at Montmorency, and Buffon he neglected to visit; but so congenial did he find the society for which his education had so well prepared him, and into which some literary reputation had already preceded him, that he declared, "Had I been rich and independent, I should have prolonged and perhaps have fixed my residence at Paris."

From France he proceeded to Switzerland, and spent nearly a year at Lausanne, where many old friendships, and studies were resumed, and new ones begun. His reading was largely designed to enable him fully to profit by the long contemplated Italian tour which began in April, 1764, and lasted somewhat more than a year. He has recorded one or two interesting notes on Turin, Genoa, Florence, and other towns at which halt was made on his route; but Rome was the great

object of his pilgrimage, and the words in which he has alluded to the feelings with which he approached it are such as cannot be omitted from any sketch of Gibbon, however brief. "My temper is not very susceptible of enthusiasm, and enthusiasm which I do not feel I have ever scorned to affect. But at the distance of twenty-five years I can neither forget nor express the strong emotions which agitated my mind as I first approached and entered the Eternal City. After a sleepless night, I trod with a lofty step the ruins of the forum; each memorable spot, where Romulus stood, or Tully spoke, or Cæsar fell, was at once present to my eye; and several days of intoxication were lost or enjoyed before I could descend to a cool and minute investigation." Here at last his long yearning for some great theme worthy of his historic genius was gratified. The first conception of the *Decline and Fall* arose as he lingered one evening amidst the vestiges of ancient glory. "It was at Rome, on October 15, 1764, as I sat musing amidst the ruins of the Capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started to my mind."

The five years and a half which intervened between his return from this tour, in June, 1765, and the death of his father in November, 1770, seemed to have formed the portion of his life which "he passed with the least enjoyment and remembered with the least satisfaction." He attended, every spring, the meetings of the militia at Southampton, and rose successively to the rank of major and lieutenant-colonel commandant; but was each year "more disgusted with the inn, the wine, the company, and the tiresome repetition of the annual attendance and daily exercise." From his own account, however, it appears that other and deeper causes produced this discontent. Sincerely attached to his home, he yet felt the anomaly of his position. At thirty, still a dependant, without a settled occupation, without a definite social status, he often regretted that he had not "embraced the lucrative pursuits of the law or of trade, the chances of civil office or India adventure, or even the fat slumbers of the church." From the emoluments of a profession he "might have derived an ample fortune, or a competent income, instead of being stinted to the same narrow allowance, to be increased only by an event which he sincerely deprecated." Doubtless the secret fire of a consuming, but as yet ungratified, literary ambition, also troubled his repose. He was still contemplating, "at an awful distance," *The Decline and Fall*, and meantime revolved some other subjects, that seemed more immediately practicable. Hesitating for some time between the revolutions of Florence and those of Switzerland, he consulted M. Deyverdun, a young Swiss with whom he had formed a close and intimate friendship during his first residence at Lausanne, and finally decided in favor of the land which was his "friend's by birth" and "his own by adoption." He executed the first book in French; it was read (in 1767), as an anonymous production, before a literary society of foreigners in London, and condemned. Gibbon sat and listened unobserved to their strictures. It never got beyond that rehearsal; Hume, indeed, approved of the performance, only deprecating as unwise the author's preference for French; but Gibbon sided with the majority.

In 1776 also, he joined with M. Deyverdun in starting a literary journal under the title of *Mémoires Littéraires de la Grande Bretagne*. But its circulation was limited, and only the second volume had appeared (1768) when Deyverdun went abroad. The materials already collected for a third volume were suppressed. It is interesting, however, to know that in the first volume is a

review by Gibbon of Lord Lyttelton's *History of Henry II.*, and that the second volume contains a contribution by Hume on Walpole's *Historic Doubts*.

The next appearance of the historian made a deeper impression. It was the first distinct print of the lion's foot. He attacked, and attacked successfully, the redoubtable Warburton. Of the many paradoxes in the *Divine Legation*, few are more extravagant than the theory that Virgil, in the sixth book of his *Æneid*, intended to allegorize, in the visit of his hero and the Sibyl to the shades, the initiation of Æneas, as a law-giver, into the Eleusinian mysteries. This theory Gibbon completely exploded in his *Critical Observations* (1770)—no very difficult task, indeed, but achieved in a style, and with a profusion of learning, which called forth the warmest commendations both at home and abroad. Warburton never replied; and few will believe that he would not, if he had not thought silence more discreet.

Soon after his "release from the fruitless task of the Swiss revolution" in 1768, he had gradually advanced from the wish to the hope, from the hope to the design, from the design to the execution of his great historical work. His preparations were indeed vast. The classics, "as low as Tacitus, Pliny the Younger, and Juvenal," had been long familiar. He now "plunged into the ocean of the Augustan history," and "with pen almost always in hand," pored over all the original records, Greek and Latin, between Trajan and the last of the Western Cæsars. The Christian apologists and their pagan assailants; the Theodosian Code, with Godefroy's commentary; the *Annals and Antiquities* of Muratori, collated with "the parallel or transverse lines" of Sigonius and Maffei, Pagi and Baronius, were all critically studied. He deepened and extended his acquaintance with Greek, particularly with his favorite authors Homer and Xenophon; and, to crown all, he succeeded in achieving the third perusal of Blackstone's *Commentaries*.

The course of his study was for some time seriously interrupted by his father's illness and death in 1770, and by the many distractions connected with the transference of his residence from Buriton to London. It was not, indeed, until October, 1772, that he found himself at last independent, and fairly settled in his house and library, with full leisure and opportunity to set about composition of the first volume of his history. Even then it appears from his own confession that he long brooded over the chaos of materials he had amassed before light dawned upon it. At the commencement, he says, "all was dark and doubtful;" the limits, divisions, even the title of his work were undetermined; the first chapter was composed three times, and the second and third twice, before he was satisfied with his efforts. This prolonged meditation on his design and its execution was ultimately well repaid by the result; so methodical did his ideas become, and so readily did his materials shape themselves, that, with the above exceptions, the original MS. of the entire six quartos was sent uncopied to the printers. He also says that not a sheet had been seen by any other eyes than those of author and printer, a statement, indeed, which must be taken with a small deduction; or rather we must suppose that a few chapters had been submitted, if not to the "eyes," to the "ears" of others; for he elsewhere tells us that he was "soon disgusted with the modest practice of reading the manuscript to his friends." Such, however, were his preliminary difficulties that he confesses he was often "tempted to cast away the labor of seven years;" and it was not until February, 1776, that the first volume was published. The success was instant, and, for a quarto, probably unprece-

dented. The entire impression was exhausted in a few days; a second and a third edition were scarcely adequate to the demand. The author might almost have said, as Lord Byron after the publication of *Childe Harold*, that "he awoke one morning and found himself famous."

Two years before the publication of this first volume Gibbon was elected member of parliament for Liskeard (1774). His political duties did not suspend his prosecution of his history, except on one occasion, and for a little while, in 1779, when he undertook, on behalf of the ministry, a task which, if well performed, was also, it must be added, well rewarded. The French Government had issued a manifesto preparatory to a declaration of war, and Gibbon was solicited by Chancellor Thurlow and Lord Weymouth, secretary of state, to answer it. In compliance with this request he produced the able *Mémoire Justificatif*, composed in French, and delivered to the courts of Europe; and shortly afterward he received a seat at the Board of Trade and Plantations—little more than a sinecure in itself, but with a very substantial salary of nearly £800 per annum.

In April, 1781, the second and third quartos of his *History* were published. They excited no controversy, and were comparatively little talked about—so little, indeed, as to have extorted from him a half murmur about "coldness and prejudice." The volumes, however, were bought and read with silent avidity. Meanwhile public events were developing in a manner that had a considerable influence upon the manner in which the remaining years of the historian's life were spent. At the general election in 1780 he had lost his seat for Liskeard, but had subsequently been elected for Lymington. The ministry of Lord North, however, was tottering, and soon after fell; the Board of Trade was abolished by the passing of Burke's bill in 1782, and Gibbon's salary vanished with it—no trifle, for his expenditure had been for three years on a scale somewhat disproportionate to his private fortune. He did not like to depend on statesmen's promises, which are proverbially uncertain of fulfillment; he as little liked to retrench; and he was wearied of parliament, where he had never given any but silent votes. Urged by such considerations, he once more turned his eyes to the scene of his early exile, where he might live on his decent patrimony in a style which was impossible in England, and pursue unembarrassed his literary studies. He therefore resolved to fix himself at Lausanne.

Having sold all his property except his library—to him equally a necessity and a luxury—Gibbon repaired to Lausanne in September, 1783, and took up his abode with his early friend Deyverdun, now a resident there. Perfectly free from every engagement but those which his own tastes imposed, easy in his circumstances, commanding just as much society, and that as select, as he pleased, with the noblest scenery spread out at his feet, no situation can be imagined more favorable for the prosecution of his literary enterprise; a hermit in his study as long as he chose, he found the most delightful recreation always ready for him at the threshold.

When once fairly seated at his task, he proceeded in this delightful retreat, leisurely, yet rapidly, to its completion. The fourth volume, partly written in 1782, was completed in June, 1784; the preparation of the fifth volume occupied less than two years; while the sixth and last, begun May 18, 1786, was finished in thirteen months. The feelings with which he brought his labors to a close must be described in his own inimitable words: "It was on the day, or rather night, of the 27th of June, 1787, between the hours of eleven and twelve, that I wrote the last lines of the last page in a

summer-house in my garden. After laying down my pen, I took several turns in a *berceau*, or covered walk of acacias, which commands a prospect of the country, the lake and the mountains. The air was temperate, the sky serene, the silver orb of the moon was reflected from the waters, and all nature was silent. I will not dissemble the first emotions of joy on the recovery of my freedom, and, perhaps, the establishment of my fame. But my pride was soon humbled, and a sober melancholy was spread over my mind by the idea that I had taken an everlasting leave of an old and agreeable companion, and that, whatsoever might be the future date of my *History*, the life of the historian must be short and precarious."

Taking the manuscript with him, Gibbon, after an absence of four years, once more visited London in 1787; and the fifty-first anniversary of the author's birthday (April 27, 1788), witnessed the publication of the last three volumes of *The Decline and Fall*. They met with a quick and easy sale, were very extensively read, and very liberally and deservedly praised for the unflagging industry and vigor they displayed, though just exception, if only on the score of good taste, was taken to the scoffing tone he continued to maintain in all passages where the Christian religion was specially concerned, and much fault was found with the indecency of some of his notes.

He returned to Switzerland in July, 1788, cherishing vague schemes of fresh literary activity; but genuine sorrow caused by the death of his friend Deyverdun interfered with steady work, nor was it easy for him to fix on a new subject which should be at once congenial and proportioned to his powers; while the premonitory mutterings of the great thunderstorm of the French Revolution, which reverberated in hollow echoes even through the quiet valleys of Switzerland, further troubled his repose. For some months he found amusement in the preparation of the delightful *Memoirs* (1789) from which most of our knowledge of his personal history is derived; but his letters to friends in England, written between 1788 and 1793 occasionally betray a slight but unmistakable tone of *ennui*. In April, 1793, he unexpectedly received tidings of the death of Lady Sheffield; and the motive of friendship thus supplied combined with the pressure of public events to urge him homeward. He arrived in England on the following June, and spent the summer at Sheffield Place, where his presence was even more highly prized than it had ever before been. Returning to London early in November, he found it necessary to consult his physicians for a symptom which, neglected since 1761, had gradually become complicated with hydrocele, and was now imperatively demanding surgical aid; but the painful operations which had to be performed did not interfere with his customary cheerfulness, nor did they prevent him from paying a Christmas visit to Sheffield Place. Here, however, fever made its appearance; and a removal to London (January 6, 1794), was considered imperative. Another operation brought him some relief; but a relapse occurred during the night of the 15th, and on the following day he peacefully breathed his last. His remains were laid in the burial place of the Sheffield family, Fletching, Sussex, where an epitaph by Doctor Parr describes his character and work in the language at once of elegance, of moderation and of truth.

The personal appearance of Gibbon as a lad of sixteen is brought before us somewhat dimly in M. Pavilliard's description of the "thin little figure, with a large head, disputing and arguing, with the greatest ability, all the best arguments that had ever been used in favor of popery." What he afterward became has been made

more vividly familiar by the clever silhouette prefixed to the *Miscellaneous Works* (Gibbon himself, at least, we know, did not regard it as a caricature), and by Sir Joshua Reynolds' portrait so often engraved. It is hardly fair perhaps to add a reference to Suard's highly-colored description of the short Silenus-like figure, not more than fifty-six inches in height, the slim legs, the large turned-in feet, the shrill piercing voice; but almost every one will remember, from Croker's *Boswell*, Colman's account of the great historian "tapping his snuff-box, smirking and smiling, and rounding his periods" from that mellifluous mouth.

The history of Rome is, for the many centuries which Gibbon treats, the history of the world; and it is nothing less than astonishing that he should have been able to work with so much ease the vast and incongruous materials into such a unity of design. It is the amplest historic canvas ever spread, the largest historic painting ever executed by a single hand; and only a comprehensive and orderly intellect of the highest rank could have grappled, as Gibbon has done, with the task of blending that vast array of nations, in all their varieties of costume, habit, language and religion into one picturesque and harmonious whole. If Gibbon had ever been conscious of any inexactitude in his mental habit, it was a defect which he very early and very successfully remedied. No man could declare more honestly than he that "curiosity as well as duty had led him carefully to examine all the original documents that could illustrate the subjects which he had undertaken to treat." With incredible labor he was able to bring at last to his great life-work a mind capable equally of ascending to the most comprehensive, and of descending to the most minute surveys; of appreciating the beautiful and sublime in classic literature, and of delighting in the verbal criticism, the tedious collation, and dry antiquarian research by which the text is established or illustrated; of celebrating the more imposing events of history with congenial pomp of description, and of investigating, with the dulllest plodder's patience and perseverance, the origin of nations, the emigration of obscure tribes, and the unpromising, yet instructive, problems which ethnology presents. In his pages the widest deductions of historic philosophy alternate with attempts to fix the true reading of an obscure passage, or a minute point of chronology or geography. It may even be said that in these last investigations he took almost as much delight as in depicting the grander scenes of history, and surrendered himself as absolutely for the time to the migrations of the Goths and Scythians as to the campaigns of Belisarius, or the conquests of the Saracens. Never has historian evinced greater logical sagacity in making comparatively obscure details yield important inferences, or held with firmer hand the balance in the case of conflicting probabilities; by no one has sounder judgment or greater self-control been, on the whole, more uniformly exhibited in cases where it is so easy for learned enthusiasm to run into fanciful hypotheses.

While thus entitled to great and manifold praise *The Decline and Fall* has not been, and can never be, exempt from a certain measure of just censure. Even when the occasional Gallicisms and grammatical absurdities pointed out by the industry of critics have been willingly overlooked, there yet remains something to be said on the defects of its style. Precise, energetic, massive it is; splendid, when the pictorial demands of the narrative require it, as that of Livy; and sometimes, where profound reflections are to be concisely expressed, as sententious and graphic as that of Tacitus. But, with all its great merits, it is too often formal and inflexible, and is apt to pall on the ear by the too frequent recurrence of the same cadence at equal intervals.

and the too unsparing use of antithesis. It is not veined marble, but an exquisite tessellation; not the fluent naturally-winding stream, but a stately aqueduct, faced with stone, adorned with wooded embankments, or flowing over noble arches, but an aqueduct still. It is a just criticism of Sir James Mackintosh that probably no great writer ever derived less benefit from his professed models. Pascal, Voltaire, Hume, were his delight; and he acknowledges, as so unsuccessful a pupil well might, that he often closed the pages of the last with a feeling of despair. Addison and Swift he read for the very purpose of improving his acquaintance with the idiomatic English, yet, as the above critic remarks, "with so little success, that in the very act of characterizing these writers, he has deviated not a little from that beautiful simplicity which is their peculiar distinction."

GIBBONS, GRINLING, an eminent English sculptor and wood carver, was born at Rotterdam, April 4, 1648. Of English descent, probably, he had for some time practiced his art in England, when Evelyn found him carving on wood Tintoretto's *Crucifixion*, and on Evelyn's recommendation he was appointed by Charles II. to a place in the Board of Works, and employed in the ornamental carving of the choir of the chapel at Windsor. His works display great taste and delicacy of finish, and his flowers and foliage have almost the lightness of nature. For the choir of St. Paul's, London, he executed the foliage and festoons, and those in lime tree which decorate the side aisles. At Chatsworth, at Burleigh, at Southwick, Hampshire, and other mansions of the English nobility, he executed an immense quantity of carved embellishment; the ceiling of a room at Petworth is regarded as his *chef-d'œuvre*. He also produced several fine pieces in marble and bronze. Among these are the statue of James II., at Whitehall; the base of the statue of Charles I., at Charing Cross; and that of Charles II., at the Bank of England. He died in London, August 3, 1721.

GIBBONS, ORLANDO, one of the greatest of English musicians, was born at Cambridge in 1583, and was probably brought up in the choir of one of the college chapels. His elder brothers, Edward and Ellis, were both eminent organists and composers. The chief events of Gibbons' short life are soon told. On March 24, 1604, he was appointed organist to the Chapel Royal, London. In 1606 he took the degree of Mus. Bac. at Cambridge, and in 1622, at the instance of Camden, that of Mus. Doc. at Oxford. His exercise was the well-known eight-part anthem, "O Clap Your Hands." In 1623 he became organist at Westminster Abbey. In May, 1625, he went with the king and court to Canterbury, to await the arrival of Henrietta Maria, and while there on June 5 died of what appears to be apoplexy. His monument, with a bust, is in the north aisle of the nave at Canterbury, and a portrait is in the Music School at Oxford. His wife's name was Elizabeth Patton; and of their seven children six survived him, two of whom, Christopher and Orlando, were musicians.

Gibbons' reputation as an organist was great; he had the 'best hand in England.' His compositions are not numerous, but most of them are pure gold. The best known are his Morning and Evening Service in F; the anthems, "O Clap your Hands," and "God is Gone up" (eight-parts); "Hosanna," "Lift up your Heads" (six-parts); and "Almighty and Everlasting God" (four-parts); the five-part madrigals, "The Silver Swan," "O that the Learned Poets," and "Dainty, Fine, Sweet Bird." Besides these he left Preces and hymns, a score of anthems, both full and verse; seventeen madrigals, the remainder of the volume published in 1612; nine fantasies for strings (1611); six pieces for the virginals, included in "Parthenia" (1612) and a few other miscel-

aneous pieces. These show him to have been not only learned, as all musicians of that time were learned, but animated by grace, dignity and sentiment, such as was possessed by none of his predecessors in the school. Nothing more noble and spirited was ever written than his "Hosanna," nothing more touchingly religious and beautiful than his "Almighty and Everlasting," or "The Silver Swan." In these exquisite compositions the art disappears, and the sentiment of the words is immediately seized. His Service, for propriety, dignity, and beauty, remains above all that preceded or followed it. It and the anthems named above retain their constant place in English choirs.

With Gibbons the great church school of England came to an end. Byrd had died in 1623, two years before him, and Bull, Weelkes, Dowland, and others of the old giants departed just at this date. The great troubles followed very shortly and the death of the king and the destruction of the Civil War; music was all but extinguished, and the new school began on fresh foundations with the Restoration, in the persons of Pelham Humfrey, Blow, and Purcell. But Orlando Gibbons is the culmination of the ancient musical art of England, and as long as voices can sing and hearts can delight in real beauty he will remain at the head of the English church school of music. For the full list of his works and other details, see *Grove's Dictionary of Music and Musicians*.

GIBEON, a town famous in Old Testament history, known under the name of El Jib, situated five miles northwest of Jerusalem. It is now a small village standing on an isolated hill above a flat corn valley. The famous spring (2 Sam. ii. 13) comes out from under a cliff on the southeast side of the hill, and the water runs to a reservoir lower down.

GIBRALTAR (Spanish, *Gibraltar*), an isolated mass of rock in the southwest of Spain, rising to an altitude of 1,408 feet, three miles in length and three-fourths of a mile in average breadth, is situated at the extremity of a low sandy peninsula, which connects it on the north with Andalusia; its most southern headland, Point Europa, is in 36° 2' 30" N. lat., and 5° 15' 32" W. long. Its western side is washed by the Bay of Gibraltar, called also the Bay of Algeciras; and at the foot of the rock on this same side is the town of Gibraltar, which consists of two parts, the South Town, above the dockyard, and the North Town, which has narrow streets and many mean houses, and is inhabited by a motley agglomeration of English, Spaniards, Moors and Jews. Population (1901), 27,460, including the garrison of 5,000 to 5,500 men. Among the more important of the public institutions must be mentioned the numerous barracks; the governor's official residence, called the Convent—it formerly belonged to the Franciscans; the naval hospital; the Alameda Gardens, stretching between the North Town and the South Town; the signal station, crowning the central eminence of the rock, 1,255 feet high; the remains of the ancient Moorish castle, founded in the tenth century; and the lighthouse on Point Europa, erected in 1841, whose light, 150 feet above the sea, is seen for twenty miles. At the northern base of the rock is the open space called the North Front, extending as far as the British lines; here are the cemetery, the cricket-ground, the race-course, etc. Between the British and the Spanish lines is the Neutral Ground, which is uninhabited. On the west side of the rock, south of the Alameda Gardens, are the naval victualling-yard and the naval dockyard. This latter dates from the eighteenth century, and is protected on the south by a new mole, a quarter of a mile long. The merchant-vessels which visit the town find good anchorage in the Bay of Gibraltar, eight miles long by five

wide. Gibraltar has been a free port since its capture by the British. Until the introduction of steam vessels, especially for a score of years from 1808, it was one of the chief commercial emporia of the Mediterranean. Nevertheless the burden of the vessels entering and filling increased from 5,128,484 tons (of which 4,165,345 were British) in 1878 to 10,499,851 (8,541,370 British) in 1887. Gibraltar is an important coaling station. The governor exercises all the functions of a legislative and executive; but the local affairs of the town are managed by a body of sanitary commissioners. Since 1842 Gibraltar has been the see of an Anglican bishop with an extensive jurisdiction.

Almost the entire rock bristles with artillery. Every spot from which a gun can be brought to bear is occupied by cannon, which oftentimes quaintly creep out of the most secluded nooks, among geraniums and flowering plants, while huge piles of shot and shell, some of enormous size, are stowed away in convenient places, screened from an enemy's fire, but all ready for use. The approaches from the north across the flat isthmus connecting the rock with Spain, and from the sea, the south and southwest sides are guarded by a great number of very powerful batteries mounted with guns of the heaviest caliber, and by fortifications so strong in themselves and in their relative bearings on each other that the rock may fairly be regarded as impregnable so long as a sufficient garrison remains for its defense, and sufficient provision for the maintenance of the troops and any civil inhabitants suffered to reside there during hostilities. Moreover, a sea wall defended by a system of flanking bastions and strengthened by a breakwater constructed in 1846, extends along the western base of the rock from the new mole to the old. Toward the north and the northwest the defenses are aided by a series of fortified galleries, some two to three miles in length. These consist of an upper and lower tier; in the former are two large halls; one, St. George's, is fifty feet long by thirty-five wide. Port-holes are cut in these galleries for cannon at intervals of twelve yards. The eastern side is so precipitous as to be altogether secure from assault. The annual cost to the British government of maintaining the garrison and fortifications averages about \$1,650,000. In these days, however, of steamships and heavy long range guns the military importance of Gibraltar has certainly diminished.

The rock is composed of Jurassic limestone resting on a Silurian basement. The surface presents a bare and repellent aspect, principally due to the absence of trees; nevertheless there are grassy wooded glens in the nooks of the mountain. The rocky mass is perforated by numerous caverns, some of which penetrate for several hundred feet into the rock. The largest, called the "Hall of St. Michael," is 220 feet long, 90 feet wide, and 70 feet high, and its floor is connected with the roof by stalactite pillars ranging up to fifty feet in height, linked by arches on the top. The entrance lies about 1,100 feet above the level of the sea. Large stalactites are found in most of the other caverns and interesting fossils abound throughout the peninsula. Gibraltar is the only place in Europe where monkeys live wild, but in 1881 the colony had dwindled down to about twenty members.

Gibraltar has been known in history since the days of the early Phœnician navigators. The Greeks called it Calpe, and it and Abyla (now Ceuta) opposite formed the Pillars of Hercules, and were held to be the western boundary of the world. We have no certain information of its natural strength being made available for defensive or aggressive purposes until the year 711 A.D. when the Saracen leader, Tarik, a general of the Calif Al-Walid, crossing from Africa for the invasion of the

Visigothic kingdom, fortified it as a base of operations, and a ready point of access from the Barbary coast. From the chieftain it took the name of Gebel-el-Tarik or hill of Tarik, of which Gibraltar is a corruption. One of the old towers of his early castle still remains. In 1302 Ferdinand II., of Castile, won it from the Moors, but in 1333 it fell to the army of the king of Fez, whom a siege by the Castilian monarch failed to dislodge. In 1410 Yussuf, king of Granada, possessed himself of the fortress, which, however, was finally wrested from the Moors by the Spaniards in 1462, and by them refortified and strengthened in every way. A combined Dutch and English force, however, under Sir George Rooke and Admiral Byng, and the Prince of Hesse-Darmstadt, after a vigorous bombardment and a landing in force, compelled the governor to capitulate in 1704.

Since 1704 Gibraltar has remained continuously in the possession of the British in spite of many desperate efforts on the part of Spain and France to dislodge them. Before the victors had been able to add to the defenses their mettle was severely tried by two attacks in 1704-5. The most memorable of the sieges to which Gibraltar has been exposed commenced June 21, 1797, when, Great Britain being engaged in the struggle with its revolted colonies and at the same time at war with France, Spain took the opportunity of joining the coalition and made a most determined attempt to subdue the garrison of this isolated fortress. It was, however, defended with heroic valor by General Elliott (afterward created Lord Heathfield) and 5,000 men, including 1,100 Hanoverians. Several times the defenders were on the point of starvation. On November 26, 1781, in a desperate midnight sally, the British succeeded in destroying the more advanced of the enemy's lines on the land side, in setting fire to many of his batteries, and in blowing up his principal depôt of ammunition. At length in July, 1782, the Spaniards were reinforced by the French, the Duc de Crillon took command of the assailants, and preparations were made for a grand assault. Additional batteries were constructed on the land side and floating batteries built to bombard the fortress from the sea. Covered boats, destined to disembark 40,000 troops, were at the same time prepared. The effective force with which General Elliott had to withstand these efforts comprised about 7,000 men. The attack commenced on September 8th by a furious bombardment simultaneously on all sides and it was kept up without intermission until the 14th, but by means of red hot balls and incendiary shells the otherwise invulnerable floating-batteries were all set on fire and destroyed and the attack was completely repulsed, with a loss to the garrison of only sixteen killed and sixty-eight wounded. Since then the fortress has enjoyed immunity from attack. See Brinkwater's *History of the Siege of Gibraltar* (1785); Gibbard's *History of Gibraltar* (1881); H. M. Field, *Gibraltar* (New York, 1889).

GIBRALTAR, STRAITS OF (anciently the *Straits of Hercules*), connect the Mediterranean with the Atlantic. They narrow toward the east, their width between Point Europa and Cape Ceuta being only fifteen miles, and at the western extremity twenty-four; the northwest part measures nine miles. The length (from east to west) is thirty-six miles. A constant surface current which runs in from the Atlantic is counterbalanced by an undercurrent from the Mediterranean.

GIBSON, EDMUND (1669-1748), bishop of London, the learned compiler of the *Codex Juris Ecclesiastici Anglicani*, was born at Bampton in Westmoreland.

GIBSON, JOHN, sculptor, was born near Conway, England, in 1790, in very humble circumstances, his father being a market gardener. He is a notable ex-

ample or one who, with no so-called start in life, carved his way to distinction by the force of a steady purpose and strong will. He was, after a few years of schooling, bound apprentice to a firm of cabinetmakers, with whom he learned the art of wood carving. Finally, his indentures were bought by a marble cutter, a Mr. Francis, who paid £70 for his unexpired time. Francis paid the lad 6s. a week, and received good prices for his works,—sundry early works by the youthful sculptor, which exist in Liverpool and the neighborhood, going by the name of Francis to this day. It was while thus apprenticed that Gibson attracted the notice of Mr. Roscoe, whose taste in Greek art seems to have been superior to his judgment in Italian history. For him Gibson executed a basso rilievo in terra cotta, now in the Liverpool Museum. Roscoe opened to the sculptor the treasures of his library at Allerton, by which he became acquainted with the designs of the great Italian masters. A cartoon of the Fall of the Angels marked this period,—now also in the Liverpool Museum. Roscoe was an excellent guide to the young aspirant, pointing to the Greeks as the only examples for a sculptor. Gibson here found his true vocation. A basso rilievo of Psyche carried by the Zephyrs was the result. He sent it to the Royal Academy, where Flaxman, recognizing its merits, gave it an excellent place. He went to Rome in October, 1817, at a comparatively late age for a first visit. In Rome he first became acquainted with rules and technicalities, in which the merest tyro was before him. Canova introduced him into the Academy supported by Austria, and, as is natural with a mind like Gibson's, the first sense of his deficiencies in common matters of practice was depressing to him. His subjects were gleaned from the free actions of the splendid Italian people noticed in his walks, and afterward baptized with such mythological names as best fitted them. Thus, a girl kissing a child, with a sudden wring of the figure, over the shoulder, became a Nymph and Cupid; a woman helping her child with his foot on her hand on to her lap, a Bacchante and Faun; his Amazon thrown from her Horse, one of his most original productions, was taken from an accident he witnessed to a female rider in a circus; and the Hunter holding in his Dog, was also the result of a street scene. The prominence he gave among his favorite subjects to the little god "of soft tribulations" was no less owing to his facilities for observing the all but naked Italian children, in the hot summers he spent in Rome.

In monumental and portrait statues for public places, necessarily represented in postures of dignity and repose, Gibson was very happy. Great as he was in the round, Gibson's chief excellence lay in basso rilievo, and in this less disputed sphere he obtained his greatest triumphs. Gibson's power of drawing may be pronounced to have been unsurpassed by any modern. He had an iron hand, and used the pen in rapid action with as much certainty as if it had been the graver. Gibson was the first to introduce color on his statues,—first, as a mere border to the drapery of a portrait statue of the Queen, and by degrees extended to the entire flesh. Gibson's individuality was too strongly marked to be affected by any outward circumstances. In all worldly affairs and business of daily life he was simple and guileless in the extreme; but he was resolute in matters of principle, determined to walk straight at any cost of personal advantage. Unlike most artists, he was neither nervous nor irritable in temperament. It was said of him that he made the heathen mythology his religion; and indeed in serenity of nature, feeling for the beautiful, and a certain philosophy of mind, he may be accepted as a type of what a pure-minded Greek pagan, in the zenith of Greek art, may have been. Gibson was elected R. A. in 1836, and

bequeathed all his property and the contents of his studio to the Royal Academy, where his marbles and casts are open to the public. He died at Rome in January, 1866.

GICHTTEL, JOHANN GEORG, founder of the mystic sect of Gichtelians or Angelic Brethren, was born at Ratisbon, March 14, 1638. He became an ardent student and disciple of Jacob Boehme, whose works he published in 1682; but before the time of his death, which occurred in 1710 he had attracted to himself a small band of followers known as Gichtelians or Angelic Brethren, who propagated certain views at which he had arrived independently of Boehme. Seeking ever to hear the authoritative voice of God within them, and endeavoring to attain to a life altogether free from carnal desires, like that of "the angels in heaven, who neither marry nor are given in marriage," they claimed to exercise a priesthood "after the order of Melchizedek," appeasing the wrath of God, and ransoming the souls of the lost by sufferings endured vicariously after the example of Christ. The sect, never a numerous one, is said still to subsist in some districts of Holland and North Germany.

GIDEON, liberator, reformer, and "judge" of Israel, was the youngest son of Joash, of the "house" of Abiezer, and tribe of Manasseh, and had his home at Ophrah, the site of which is probably to be sought westward of Jordan, somewhat to the south of the plain of Jezreel. Gideon lived at a time when Israel, grown idolatrous, had been brought very low by periodic incursions of the "Midianites" and "Amalekites," nomad tribes from the east of Jordan, who in great numbers were wont to overrun the country, destroying all that they could not carry away. In the beginning of the narrative of his public life he is represented as an unambitious man, quietly engaged in agricultural pursuits, who yet had already distinguished himself as a "mighty man of valor," probably in guerilla warfare against the common foe. According to that narrative, his first exploit worthy of special commemoration, was the destruction, by divine command, of the altar of Baal belonging to his father, and of the Ashera beside it, and the substitution of an altar to Jehovah. But immediately before this he had also been summoned by "the angel of the Lord" to undertake, in dependence on supernatural direction and help, the work of liberating his country from its long oppression, and, in token that he accepted the mission, had already erected in Ophrah an altar which he called "Jahveh-Shalom" (Jehovah is prosperity). The great gathering of the Midianites and their allies on the north side of the plain of Jezreel "stretching from the hill of Moreh;" the general muster first of Abiezer, then of all Manasseh, and lastly of the neighboring tribes of Asher, Zebulun, and Naphtali; the signs by which the wavering faith of Gideon was steadied; the methods by which an unwieldy mob was reduced to a small but trusty band of energetic and determined men; and the stratagem by which the vast army of Midian was surprised and routed by the handful of Israelites descending from "above Endor," are indicated with sufficient clearness in the Scripture narrative, and need not be detailed. There is some difficulty in following the account of the subsequent flight of the Midianites, which seems to have taken place in two directions—Oreb and Zeeb making for the lower fords of Jordan toward the southeast, while Zebah and Zalmunna took the upper passage, a little below the place where the river flows out of the Sea of Galilee. Leaving the Ephraimites (who had now risen in force) to deal with the former, Gideon with his 300 appears to have kept up the pursuit of the latter to Nobah and Togbeah, points beyond Succoth and Penuel, where a bloody contest resulted in the destruction of that portion

of the Midianite army, and in the ultimate capture and execution of Zebah and Zalmunna. Almost simultaneously with these occurrences eastward of Jordan, messengers from Ephraim bearing the heads of Oreb ("raven") and Zeeb ("wolf"), who with their followers had been crushed at "the raven's rock" and "the wolf's den" respectively, announced the completeness of Israel's victory. Having taken unrelenting vengeance on the men of Penuel and Succoth, who had shown a timid neutrality when the patriotic struggle was at its crisis, Gideon returned to his native Ophrah, where he further distinguished himself by his pious magnanimity in refusing the kingship which had been put within his reach—an act of self-denial, however, which, according to the sacred historian, was somewhat neutralized by his subsequent folly in establishing a shrine which proved a snare to all Israel, not excluding his family or even himself. For forty years after the great victory helived at his own house in Ophrah in considerable wealth and magnificence, yet always in a private station—there being no direct scriptural evidence at least that his judgeship lasted during all that period, or that it ever gave him any position of legally recognized authority.

GIEN, a town of France, at the head of an arrondissement in the department of Loiret, is situated on the right bank of the Loire, thirty-nine miles east-southeast of Orleans.

GIESEBRECHT, WILHELM VON, historian, born March 5, 1814, in Berlin, became professor of history at Königsberg in 1857, and in 1862 at Munich. His chief works are *Geschichte der Deutschen Kaiserzeit* (5 vols., 1855–80); *Jahrbücher des Deutschen Reichs* (1840); a translation of Gregory of Tours (1851); *Deutsche Reden* (1871); *Arnold von Brescia* (1873).

GIESELER, JOHANN KARL LUDWIG, one of the most distinguished of the modern school of scientific writers on church history, was born at Petershagen, near Minden, on March 3, 1792. In his tenth year he entered the orphanage at Halle, whence he duly passed to the university, his studies being interrupted, however, from October, 1813, till the peace of 1815, by a period of military service, during which he was enrolled as a volunteer in a regiment of chasseurs. Having in 1817 taken his degree in philosophy, he in the same year became assistant head master in the Minden gymnasium, and in 1818 was appointed conrector of the gymnasium at Cleves. The first part of the first volume of his well-known *Church History* appeared in 1824. In 1833 he accepted a call to Göttingen, where the remainder of his life was spent, marked by few noteworthy events beyond the steady publication of volume after volume of his contributions to historical science. In 1837 he was appointed a consistorialrath, and shortly afterward was created a knight of the Guelphic order. In the winter of 1853–4 symptoms of failing health began to appear, and toward the end of the session he was able to lecture only occasionally. His death occurred on July 8, 1854.

GIESSEN, a town of Germany, capital of the province of Upper Hesse, in the grand-duchy of Hesse-Darmstadt, is situated in a beautiful and fruitful valley at the confluence of the Wieseck with the Lahn. The university, founded in 1607 by the landgrave Louis V., has a large and valuable library, a botanic garden, an observatory, an anatomical theater, an infirmary, a maternity hospital, a museum of natural history, and a chemical laboratory which was directed by Professor Liebig. Pop. (1901), 25,491.

GIFFEN, ROBERT, statistician and writer on trade and finance, was born at Strathaven, in Lanarkshire, Scotland, in 1837. He entered journalistic life in Scotland in 1860, and two years later removed to London,

where he was connected with the *Globe* (until 1866), the *Fortnightly Review*, the *Examiner* (1868–76) and the *Daily News* (1873–76). In 1876 he was appointed chief of the statistical department of the Board of Trade, but resigned his connection with this in 1881. He was president of the Statistical Society from 1882 to 1884, and published *Stock Exchange Securities* (1878); *Essays in Finance* (first series, 1879; fourth edition, 1886; second series, 1886), and numerous official reports and papers.

GIFFORD, ADAM, founder of the Scottish lectureships in natural theology, was born in Edinburgh in 1820, studied at the university there, and was called to the Scotch bar in 1849. He became sheriff of Orkney in 1865, was raised to the bench as Lord Gifford in January, 1870, and died at Granton, near Edinburgh, on January 20, 1887. By his will he left £125,000 to the University of Edinburgh, \$100,000 each to Glasgow and Aberdeen, and \$75,000 to St. Andrews, to endow lectureships in natural theology, subject to no dogmatic tests whatsoever. The first lecturers appointed were Max Müller, E. B. Tylor, Andrew Lang, and J. Hutchison Stirling.

GIFFORD, WILLIAM, man of letters, was born at Ashburton, Devonshire, England, in April, 1757. Left an orphan at twelve, he was first a cabin boy, then for four years a shoemaker's apprentice, till in 1776 his attempts at versifying attracted the notice of a local surgeon. With his assistance he proceeded, two years later, as a bible clerk to Exeter College, Oxford, and after graduating in 1792 travelled on the continent with Lord Grosvenor's son. His first production, the *Baviad* (1794), was a satire on the Della Cruscans; in Scott's phrase, it "squabashed" them at one blow. The *Meviad* (1796) was levelled against the corrupters of the drama, and *An Epistle to Peter Pindar*, against Dr. Wolcot, who retorted with *A Cut at a Cobbler*. Gifford's editorship of the *Anti-Jacobin* (1797–98), procuring him favor with the Tory magnates, he was appointed to offices that jointly brought him \$4,500 a year. In 1802 appeared his translation of Juvenal, and, prefixed thereto, an autobiography. He edited the works of Massinger, Ford, Shirley, and Ben Jonson, and in his notes assailed former editors with brutal ferocity. In 1809 he became the first editor of the *Quarterly Review*, and this post he filled to within two years of his death, on December 31, 1826. Gifford possessed much satirical acerbity and poison, but as a poet he holds no rank whatever. As translator and editor of the old English dramatists he did good service; but his labors in this field were marred by suspicion and malignity. As a critic he was bitterly partial and one-sided, and his onslaughts on Hazlitt, Leigh Hunt, Lamb, Wordsworth, Shelley, and Keats, have as little pretensions to fairness and candor as has Hazlitt's own onslaught on him in the *Spirit of the Age* (1825).

GIFT, in law, means a gratuitous transfer of property. Any person is at liberty to do what he pleases with his own property and can give it away with or without consideration if he is so inclined. When he gives away goods or chattels, mere delivery of possession accompanied with words of gift is sufficient to transfer the property; and then the transaction is irrevocable. But if he does not give possession of the goods at the same time, then, that the gift may be binding upon him, he must execute a deed or writing under seal. The reason of this is that a mere verbal promise, without some legal consideration, is nugatory and revocable, whereas when a person executes a deed he is estopped from ever afterward denying it. Where the property given is not personal, but real, then a deed is in general necessary to transfer the property. A will is the most

familiar example of a gift of property, both real and personal, for the testator generally in such a case gives away his property gratuitously. A gift of personalty by will is called a legacy or bequest, and a gift of land is called a devise.

GIGA, or GIGUE, the name of a short piece of music much in vogue in olden times, of a joyful or lively character, and in 6-8 or 12-8 time, sometimes in 3-8; used formerly as a dance tune and often introduced as a movement of a larger composition. *Jig* is a form of the same word. The Irish jig is a dance tune in 6-8 time.

GIJON, a town and seaport of Spain, in the province of Oviedo or Asturias, on the coast of the Cantabrian Sea. The population of Gijon in 1898 was 43,392. During the summer there is a considerable influx of strangers.

Gijon is usually identified with Gigia of the Romans, which, however, occupied the site, not of the present town, but of the adjoining suburb of Cima da Villa.

GILA, a river of North America, rising in New Mexico, and flowing nearly 680 miles westward across Arizona, until it joins the Colorado about seventy-five miles above the fall of that river into the Gulf of California.

GILA MONSTER is a name commonly given to the poisonous lizard *Heloderma suspectum*, also called the Sonoran Heloderm. It is one of the largest lizards of North America, and is found in the sandy deserts of New Mexico, Arizona and Texas. Its scales are brilliant orange and jet-black. Its poisonous qualities it shares with its congener, the *Heloderma horridum* of Mexico, which, like snakes, has grooved teeth and highly developed salivary glands at their bases. Its bite is rapidly fatal to small animals and birds, and very injurious, though seldom fatal, to man. The heloderms are the only lizards ascertained to be venomous.

GILBART, JOHN WILLIAM, the author of a number of works on banking, was descended from a Cornish family, and was born in London, March 21, 1794. He died in 1863.

GILBERT, SIR HUMPHREY, a celebrated English navigator, was born in 1539, in the county of Devon, second of the three sons of Otho Gilbert, of Greenway. By his mother's side he was half-brother to Sir Walter Raleigh, who resembled him in many points of character, and whose early life was largely influenced and guided by his example. Educated first at Eton and then at Oxford, he was destined by his father for the law; but being introduced at court by Raleigh's aunt, Catherine Ashley, he obtained the special favor of the queen, and was thus enabled to follow his natural inclination for active enterprise. Recommended by royal letter to Sir Philip Sidney, he received from him an appointment in the army in Ireland; and his services contributed so powerfully to put down the rebellion raging there that, in 1570, he was made a knight and rewarded with the government of Munster. He next served for about five years in the Netherlands, being the first English colonel intrusted with command of English forces in that country. On his return to his native land he wrote a remarkable treatise on a subject at that time before the minds of men, the possibility of a northwest passage to India; and, in 1576, it was published without his knowledge by George Gascoigne as *Discourse of a Discoverie for a new Passage to Cataia*. The theory in question was supported with no small force of argument, and the discourse was probably not without its influence in leading Frobisher to set out on his first voyage to the frozen north. In June, 1578, Gilbert received letters patent authorizing himself, his heirs and assigns, to discover, occupy and possess such remote "heathen lands not actually possessed of any Christian prince or

people, as should seem good to him or them." Disposing not only of his patrimony, but also of the estates in Kent, which he had, through his wife, daughter of John Aucher, of Ollerden, he strenuously prepared to put his permission to use, and his brother Raleigh joined him in the enterprise. By the end of the summer of 1578 a fleet of eleven sail, with four hundred marines and men-at-arms, was collected off the coast of Devon; but the gallant projectors were singularly unfortunate in the character of some of their associates. Dissensions broke out among the captains and disorder among the crews. It was not till November 10th that Gilbert set sail, with his forces reduced to seven ships and one hundred and fifty men. The history of the voyage is involved in obscurity, but about the beginning of summer or a little earlier, in 1579, the fleet returned to England, with little, it would appear, to report except that it had lost one of its chief ships and one of its bravest captains, Miles Morgan, in an encounter with the Spaniards. Gilbert lent his three ships to the government for service against the Spaniards on the Irish coast; but on July 11, 1582, we still find him complaining to Walsingham that he had not received the moneys that were due to him, and that thus he was prevented from doing more for his queen and country. He was already planning a new expedition; and at length, in 1583, his fleet was got together. On June 11th he departed from Plymouth with five sail; but, on the 13th, the *Ark Raleigh*, which had been built and manned at his brother's expense, "ran from him in fair and clear weather, having a large wind." This desertion was a cause of no small displeasure to the admiral, and he wrote to Sir George Peckham to solicit his brother to make the crew an example to all knaves; but it appears not improbable (according to Hayes in Hakluyt's collection) that the reason of their conduct was the breaking out of a contagious sickness in the ship. On August 5th Gilbert landed in Newfoundland, and took formal possession of it in the queen's name; but proceeding southward with three vessels, he lost the largest near Cape Breton, and was at last constrained to return homeward with the *Golden Hind* and the *Squirrel* as the only remnant of his fleet. "On Monday, September 9th," reports Hayes, the captain of the *Hind*, "the frigate was near cast away, yet at that time recovered; and giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the *Hind*, 'We are as near to heaven by sea as by land.' The same Monday night the frigate's lights were suddenly out, and it was devoured and swallowed up by the sea." So perished Sir Humphrey Gilbert.

GILBERT, NICOLAS JOSEPH LAURENT, a French poet, was born at Fontenay-le-Château, in Lorraine, in 1751, and died in 1780.

GILBERT, or GILBERD, WILLIAM (c. 1540-1603), was the most distinguished man of science in England during the reign of Queen Elizabeth.

GILBERT DE LA PORRÉE (*Gilbertus Porretanus* or *Pictaviensis*), an eminent scholastic logician and theologian of the twelfth century, was born at Poitiers, and died in 1154.

GILBERT OF SEMPRINGHAM, ST., founder of the order of Gilbertines, was born about the year 1083 at Sempringham, Lincolnshire, where his father, Jocelyn de Sempringham, a Norman noble who had taken part in the Conquest, had settled. On the completion of a liberal education, received partly in England and partly in France, Gilbert was ordained a priest in 1123, having been presented by his father to the united livings of Sempringham and Tirington. About 1135 he established in the immediate vicinity of his parish church a religious house for the reception of some destitute girls; the rule

he prescribed was substantially that of St. Benedict, but the restrictions laid upon the communication of the inmates with the outer world were unusually severe. Subsequently the laborers who tilled the lands with which this establishment had been endowed were also formed into a religious community, under a rule resembling that of the Austin Friars, their house being placed close beside that of the nuns. Similar institutions elsewhere were encouraged by various English proprietors, and placed under the superintendence of Gilbert, who at last made application to Pope Eugenius III. to have them all merged in the Cistercian order (1148). This request, however, was refused, and Gilbert continued to act as superior of the monasteries he had founded for many years; although at the time of his death, on February 3, 1189, that dignity was held by Roger, one of his disciples. In 1189 the Gilbertines are said to have possessed thirteen monasteries, with almshouses, hospitals, and orphanages attached; and the community numbered in all upward of 700 male and 1,100 female members. At the time of their suppression the total number of Gilbertine houses in England and Wales had increased to about twenty-five. Gilbert, who had sided and suffered with the church in the quarrels between Henry II. and Thomas à Becket, was canonized by Innocent III. in 1202; and his name is commemorated in the martyrologies on February 4th.

GILBERT ISLANDS. See POLYNESIA.

GILBOA, a bare chain of hills between 500 and 600 feet high, overhanging the site of the ancient city of Jezreel, and rising between the fertile plains of Esdraelon on the west and the green valley of the Jordan on the east. It is memorable as the scene of the defeat and death of King Saul and his three sons at the hands of the Philistines.

GILCHRIST, ALEXANDER, Blake's biographer, was born at Newington Green, England, in 1828, the son of a Unitarian minister, who, conscientiously withdrawing from the office of the ministry, removed when Alexander was a year old, to a mill near Reading. At the age of twelve Gilchrist entered University College, London, where for four years he was a diligent scholar, and formed a friendship with the Rossettis. Leaving school at sixteen he entered the Middle Temple in 1846, and was called to the bar in 1849, but never practiced. Maintaining himself chiefly by art criticism, he married in 1851. After collecting, in Yorkshire, materials for a *Life of Etty*, he settled at Guilford in 1853. The *Life of Etty*, warmly commended by Carlyle, appeared in 1855. The following year he removed to Chelsea, taking a house next door to the Carlyles. Here was composed his *Life of Blake*, a labor of love, engaging all of his faculties. Before the task was yet completed the author was cut off by scarlet fever on November 30, 1861. His wife, Anne Gilchrist, nee Burrows, was born in London in 1828. In 1851 she married; in 1855 began to write for *All the Year Round*; in 1861 for *Macmillan's Magazine*. On her husband's death she undertook the completion of his *Life of Blake* (1863), to the second edition of which (1880) is appended a Memoir of Alexander Gilchrist. In 1869 she published in the *American Radical Review*, "A Woman's Estimate of Walt Whitman," and it was largely to become personally acquainted with the poet that she spent three years in America (1876-79); when she wrote for *Blackwood's* "Glimpses of a New England Village." In 1883 appeared her *Life of Mary Lamb*. She died in 1885.

GILDAS, or GILDUS, the earliest of British historians, surnamed by some Sapiens, and by others Badonicus, seems to have been born in the year 516. Regarding him little certain is known, beyond some isolated particulars that may be gathered from hints dropped in

the course of his work. His materials, he tells us, were collected from foreign rather than native sources, the latter of which had been put beyond his reach by circumstances. The *Cambrian Annals* give 570 as the year of his death.

GILDING. There are many processes of gilding, varying with the nature of the substance to be gilded and the kind of effect required to be produced, but they may all be classified under three heads, viz.: (1) mechanical gilding, (2) chemical gilding, and (3) encaustic gilding. The first is used chiefly for gilding wood, plaster of Paris, leather, paper and other substances. If the object to be gilded is a picture or mirror frame consisting of a plain wooden molding, then after getting a coat of oil paint, from four to ten coats of whitening mixed with fine glue are put on, each in its turn being smoothed with pumice stone and fine sandpaper. This done, a coat of gold size is given to those parts not to be burnished; but those which are receive only a coating of clear animal size. Both of these prepared surfaces now receive the gold-leaf, which is laid on by means of a broad thin brush called a tip, and further pressed with a thick soft-haired brush. Those parts which have been gold-sized are in this way oil-gilded, and will stand washing; while such portions as have been gilded on the size preparation, in order to be burnished, will not bear soap and water. If the picture frame is much enriched with fine raised ornament the surface to be gilded is previously prepared with oil-paint and gold-size alone, as the coating with whitening destroys the sharpness of the work. The result, however, is more tender and less durable.

Japanner's Gilding.—Where ornaments are to be put on a japanned ground they are by one method painted with gold size and gold leaf afterward applied. By another method rather more than the space that the ornament is to occupy is wholly covered with gold leaf, adhering with isinglass. The ornament is then painted on with asphaltum, which protects the gold beneath it while the superfluous leaf is being washed away. A little turpentine will then remove the protecting asphaltum so as to display the gilt ornament. Japanners' gold-size is a mixture of linseed-oil, gum-animi, and vermilion.

False Gilding, although an old invention, has become in recent years an important trade in Germany. The molding intended to be gilded in this way is first covered with bright silver-leaf or tin foil on a surface prepared as above and then coated with a yellow varnish. Other substitutes for genuine gilding that are largely used consist in applying "Dutch gold," which is copper beaten out like gold leaf, as in genuine gilding, or in using so-called "gold-paint," which is finely powdered brass or other similar alloy.

Chemical Gilding.—Metals are now usually gilded by the process of electro-gilding; but, besides this, various methods of chemical gilding have been adopted and some are still in use.

Water, or Wash Gilding, as it is somewhat inappropriately termed, consists in applying to metal a paste formed of an amalgam of gold, and afterward evaporating the volatile mercury by heat, which leaves the gold firmly adhering to the surface of the metal.

Gilding by Immersion.—For this purpose a solution of gold in nitro-muriatic acid is used which slowly attacks the metal to be gilded, and at the same time deposits on its surface an equivalent of gold. The method called *Grecian gilding* is another similar process, in which gold is used dissolved in a solution of sal-ammoniac and corrosive sublimate in nitric acid.

Most articles that are gilded by either of the above chemical methods, or by electro-gilding, are submitted to an after-process of coloring. This consists either in acting upon the surface with a saline solution, and heat-

ing the article afterward, or in coating it with a kind of varnish of beeswax and yellow ochre, and then burning this off. The coloring of jewelry, etc., made of gold alloyed with copper or brass, is performed by submitting the article to the action of a mixture of nitre, alum, and common salt, either dry or dissolved in water, heat being applied in either case. The baser alloy is thus removed from the surface, which becomes covered with a richly colored film of nearly pure gold.

Sword-blades, lancets, and other steel articles are gilded in fancy devices by drawing the design with a camel hair pencil moistened in a solution of gold, prepared by agitating ether with a solution of terchloride of gold, and decanting the light liquid which floats on the top. Silks, artificial flowers, ivory, bone, etc., may be gilded by immersing them in, or painting them with a neutral solution of one part of terchloride of gold to four or five of water, and then exposing them in a vessel containing hydrogen gas, which readily combines with the chlorine and reduces the gold to a metallic state.

Encaustic Gilding is usually applied to glass or porcelain. The gold is first obtained in a finely divided state by precipitating from the chloride with protosulphate of iron, or by simply heating the chloride. This powder is ground up with one-twelfth of its weight of oxide of bismuth and some borax and gum water and then painted on the ware. It is then heated until the borax is vitrified and thereby fixed. Sometimes the gold is ground with turpentine, or an amalgam of gold is used. This has a brown, dingy appearance when it leaves the kiln; the gold lustre is brought up by burnishing.

Gilding Metal.—The metal of which gilded goods are made is required to have as nearly as possible the color of gold, so that when the surface gilding is worn off at the more exposed parts the difference in color will not be readily apparent. This is obtained by making a kind of brass, having a much larger proportion of copper than common brass. The following are three receipts from among a variety in use: (1) six parts copper, one common brass; (2) four parts copper to one Bristol brass; (3) thirteen parts copper, three parts brass, twelve parts tin. The last is much harder than number one or two.

GILEAD (גִּלְעָד, *i. e.*, "hard" or "rugged") is sometimes used, both in earlier and in later writers, to denote the whole of the territory occupied by the Israelites eastward of Jordan, extending from the Arnon to the southern base of Hermon. More precisely, however, it was the usual name of that mountainous district which is bounded on the north by the Hieromax (Yarmuk), on the east by the Jordan, on the south by the Arnon, and on the west by a line which may be said to follow the meridian of Ammán (Philadelphia, or Rabbath-Ammon).

GILES, St. (ÆGIDIUS, EGIDIO, GIL, or GILLES), according to the *Breviarium Romanum* (September 1st), was an Athenian of royal descent, and from his earliest years distinguished for piety and charity. On the death of his parents he, while still young, distributed among the poor his entire patrimony, including his very tunic, which garment effected a miraculous cure upon the poor sick man to whom it had been given. Shrinking from the publicity involved in this and many other (apparently involuntary) miracles, he betook himself to Provence, where, after a residence of two years with St. Cæsarius at Arles, he withdrew into the solitude of the neighboring desert, living upon herbs and the milk of a hind which came to his call at stated hours. Here he was discovered after some time by the

king of France, who on a hunting expedition had tracked the hind to the hermit's cave. With the reluctant consent of Ægidius, a monastery was now built on the spot, he being appointed its first abbot. The functions of this office he discharged with prudence and piety until his death, which occurred some years afterward.

Some uncertainty attaches to the date, as well as to several other circumstances stated in this narrative.

GILFILLAN, GEORGE, a clergyman of the United Presbyterian Church of Scotland, and a well-known popular writer, was born January 30, 1813, at Comrie, Perthshire, where his father, the Rev. Samuel Gilfillan, also a man of some literary activity, was for many years minister of a secession congregation. He died in 1878. The most extensive publication with which Gilfillan was connected was Nichol's edition of the *British Poets*; and his office was not only to secure the utmost accuracy in the text of each poet's works, but also to furnish both a biography and a critical estimate.

GILGAL. Three towns of this name are mentioned in the Bible. (1) The first and most important was situated "in the east border of Jericho," on the border between Judah and Benjamin. Josephus places it fifty stadia from Jordan and ten from Jericho; but these measurements do not agree with the position of Jericho with respect to Jordan. (2) The second Gilgal, mentioned in Joshua in connection with Dor, appears to have been situated in the maritime plain.

GILGIT (*Ghilghit*, etc.), properly a secluded valley-state on a tributary of the Upper Indus, but also applied to the tributary river and the whole of its basin, which is one of great interest in many respects, though as yet but imperfectly known.

GILL, JOHN (1697-1771), a Baptist minister and learned Rabbinical scholar, was born at Kettering, Northamptonshire, in 1697, and died in 1771.

GILLESPIE, GEORGE, a prominent figure among the Westminster Divines, was born at Kirkcaldy, Fifeshire, Scotland, where his father was parish minister, January 21, 1613. He pursued his studies at St. Andrew's and early in 1638, after the power of the bishops had been broken, was ordained minister of Wemyss, in Fifeshire. He showed characteristic fearlessness at the Glasgow Assembly that same year, was translated to Edinburgh in 1642, and the year after was sent up as one of Scotland's four representatives to the Westminster Assembly, where his vigor, ability, and earnestness enabled him to take a great part in the protracted debates on church discipline and dogma. His *Aaron's Rod Blossoming, or the Divine Ordinance of Church Government Vindicated* (1645), is admittedly a masterly statement of the high Presbyterian claim for full spiritual independence. In 1648 Gillespie was appointed moderator of the General Assembly, but his already enfeebled frame soon sank under its labors. He died at Kirkcaldy, December 17, 1648.

GILLESPIE, THOMAS, one of the founders of the Scottish "Presbytery of Relief," was born in the parish of Duddingston, Midlothian, in 1708, and died in 1774.

GILLIES, JOHN, the historian of ancient Greece, was born in 1747 at Brechin, in Forfarshire. He was educated at the university of Glasgow, where he greatly distinguished himself, and where, at the age of twenty, he officiated for a short time as substitute for the professor of Greek. In 1784 he completed his principal work, the *History of Ancient Greece, its Colonies and Conquests*, which he published two years later in two vols. 4to. This work gives a clear and generally accurate account of the various states of Greece, and the progress of each in literature and the arts. The learning it displays is considerable, but its reflections are generally

somewhat trite, and the style is abrupt and frequently diffuse. It enjoyed, however, for some time a great popularity, and was translated into French and German. It was long a favorite text-book for schools, but is now completely superseded. On the death of Robertson, Gillies was appointed historiographer-royal of Scotland. In his old age he retired to Clapham, where he died February 15, 1836, in the ninetieth year of his age.

GILLRAY, JAMES, one of the most eminent of caricaturists, was born at Chelsea in 1757. Gillray commenced life by learning letter-engraving, in which he soon became an adept. This employment, however, proving irksome, he wandered about for a time with a company of strolling players. After a very checkered experience he returned to London, and was admitted a student in the Royal Academy, supporting himself by engraving, and probably issuing a considerable number of caricatures under fictitious names.

The excesses of the French Revolution made Gilray conservative; and he issued caricature after caricature ridiculing the French and Napoleon, and glorifying John Bull. He is not, however, to be thought of as a keen political adherent of either the Whig or the Tory party; he dealt his blows pretty freely all round. Gillray died on June 1, 1815, and was buried in St. James' churchyard, Piccadilly.

GILLS, or BRANCHIÆ, organs of aquatic respiration consisting of expansions through the thin skin by which oxygen dissolved in the water is taken into the blood while carboic acid passes out. It is difficult to say what animal first exhibits gills, for respiration through the general skin is common in lower invertebrates, and the distinction between mere skin lobes and marked expansions in special connection with the vascular system is arbitrary. In star-fishes thin out-pushings of the lining of the body-cavity project through pores in the skin; a modification of this simple plan is seen in some other Echinodermata; while the characteristic tube-feet are sometimes respiratory, and the Holothurians have often respiratory tentacles. In marine worms we find every transition from vague skin respiration to the increase of this by filaments or tentacles associated with legs or head, and finally to definite gills. These are usually thin expansions, filamentous, tufted, or feathery, which project into the water, have cilia on their outer surface and blood vessels riddling them internally. In some of the lower Crustaceans again, (Branchiopoda—i.e. "gill-footed"), a number of the legs are thin enough to admit of respiration through their surfaces, while the higher forms have associated with some of their limbs special tufts of respiratory filaments, or definite feathery gills, as in the lobster. These consist of a main stem, within which are two canals, one for the impure blood from the body, the other for the return of oxygenated blood on its way to the heart; but with these canals are connected numerous hollow, thin-walled filaments, in which the real respiration is effected. In the lobster and its allies these are overlapped by the sides of the anterior shield, but water currents are kept up by the baling action of one of the anterior appendages on each side. In the King-crab (*Limulus*), rather an Arachnid than a Crustacean, five pairs of abdominal appendages bear flat "gill-books" each of which consists of an axis bearing some 150 hollow, thin-walled, blood-containing leaves. In the aquatic larvæ of some insects the air-tubes (tracheæ) are closed, but form gill-like outgrowths (tracheal gills) by means of which oxygen is absorbed. In bivalve molluscs (Lamellibranchs) the gills usually form ciliated plates on each side of the body. Each gill, or ctenidium, as it is often called, really consists of two rows of hollow processes of the

body-wall, extending downward on each side of the foot, but each filament at its free end usually bends up again, so that a cross-section has the form of a W, the medium apex of which represents the point of origin from the body-wall. Neighboring filaments become linked to one another, and ascending and descending parts of the same filaments are likewise crossed by bridges, so that finally continuous plates result, channelled by blood-containing canals. Somewhat simpler, on the whole, are the external gill filaments of chiton, of the limpet, of undibranchs, etc., or the internal gills (covered by a folding of the mantel) in many aquatic Gasteropods; or, lastly, the well developed feather-like gills in the mantle cavity of cuttle-fishes.

Among vertebrates gills are developed only as far as the amphibians, all of which have them in their youth, though many, such as the frog, have them entirely replaced by lungs in adult life. Beyond amphibians gills never occur, though branchial or visceral clefts on the sides of the pharynx remain as traces of the ancestral condition. In tunicates and in the lancelet water entering by the mouth washes the blood spread out in vessels between the slits on the walls of the pharynx, but there are no gills. In the round mouths, or Cyclostomata, the gills are inclosed in pocket-like structures, through which the water passes. In fishes we have to distinguish transitory external gills occasionally present from true internal gill-filaments borne on the branchial arches, and washed as usual by the water, which, entering by the mouth, passes out by the gill-slits. The gill of a fish generally consists of two triangular folds of mucous membrane, supported by the branchial arch and minor cartilaginous rods, and traversed by vessels with impure blood from the heart, and with oxygenated blood to the body.

GILLYFLOWER, a popular name applied to various flowers, but principally to the clove, *Dianthus Caryophyllus*, of which the carnation is a cultivated variety, and to the stock, *Matthiola incana*, a well-known garden favorite. The word is sometimes written gillflower or gilloflower, and is reputedly a corruption of July-flower, "so-called from the month they blow in."

GILPIN, BERNARD, a rector of Houghton-le Spring, distinguished by the unusual way in which he carried out his conception of the duties of a Christian pastor, was born at Kentmere, Eng., in 1517.

At Houghton his course of life was a ceaseless round of benevolent activity. His hospitable manner of living was the admiration of all. Strangers and travelers found a ready reception; and even their horses were treated with so much care that it was humorously said that, if one were turned loose in any part of the country, it would immediately make its way to the rector of Houghton. Every Sunday, from Michaelmas till Easter, was a public day with Gilpin. For the reception of his parishioners he had three tables well covered—one for gentlemen, the second for husbandmen, the third for day-laborers; and this piece of hospitality he never omitted, even when losses or scarcity made its continuance difficult. He built and endowed a grammar-school at a cost of upward of £500, educated and maintained a large number of poor children at his own charge, and provided the more promising pupils with means of studying at the universities. So many young people, indeed, flocked to his school that there was not accommodation for them in Houghton, and he had to fit up part of his house as a boarding establishment. Grieved at the ignorance and superstition which the remissness of the clergy permitted to flourish in the neighboring parishes, he used every year to visit the most neglected parts of Northumberland, Yorkshire, Cheshire, West

moreland and Cumberland; and that his own flock might not suffer, he was at the expense of a constant assistant. Among his parishioners he was looked up to as a judge, and did great service in preventing law-suits among them. If an industrious man suffered a loss, he delighted to make it good; if the harvest was bad, he was liberal in the remission of tithes. And all this he was enabled to do because his frugality was as great as his generosity; for his rectory was worth no more than £400 a year. The boldness which he could display at need is well illustrated by his action in regard to dueling. Finding one day a challenge-glove stuck up on the door of a church where he was to preach, he took it down with his own hand, and proceeded to the pulpit to inveigh against the unchristian custom. He died in 1583.

GILPIN, WILLIAM, author of several works on the scenery of Great Britain, was born at Carlisle in 1724, and died in 1804.

GILTHEAD, (*Chrysophrys*), a genus of "sea-brems" or *Sparidae* represented by about a score of species from the warmer seas, best known by the Mediterranean species (*Ch. aurata*), sometimes found on the southern coasts of England. Large species occur off the Cape of Good Hope, and *Ch. hasta* is common on East India and Chinese coasts. The gilthead has an oblong and compressed body, a single dorsal fin with spines which can be received into a groove, scaly cheeks and gill cover, and two kinds of teeth, sharp like canines in front, rounded like molars behind. The length is about a foot; the back is silvery gray, shaded with blue; the belly like polished steel; the sides have golden bands; and there is a half-moon shaped spot of gold between the eyes to which the various names of *Chrysophrys* ("golden eyebrow"), *Aurata* ("gilded"), Daurade, and Gilthead obviously refer. They feed chiefly on molluscs, in search of which they are said to stir up the sand with their tails. The fish is generally found near the shore in small shoals and its presence is sometimes betrayed to fishermen by the noise which its teeth make in crushing shells. It was often kept in the *vivaria* by the Romans, being much valued and easily fattened.

GIL VICENTE. See VICENTE, GIL.

GIMBALS (Lat. *gemellus*, "a twin"), are two circular brass hoops used for suspending the compass-box on board ship, so that it may always rest horizontally, unaffected by the ship's motion. The outer hoop is attached to a box or other fixed object, while the inner is constructed so as to allow of its moving freely within the outer, to which it is attached by two pivots at the extremities of a diameter. The compass-box is attached to the inner hoop by two smaller pivots at right angles to the former. Thus the compass moves freely in two directions at right angles to each other, and can always retain its horizontal position, however the vessel may roll or pitch. Gimbals are also applied to other instruments.

GIMP, or **GYMP**, a kind of trimming for dresses, curtains, furniture, etc., made either of silk, wool or cotton. Its peculiarity is that fine wire is twisted into the thin cord of which it is made. Gold and silver are used into the manufacture of military gimps.

GIN, the name commonly given to an aromatized spirit for drinking, varieties of which are also known as Geneva, Hollands and Schiedam. Gin is an abbreviation of Geneva, both being primarily derived from the French *genèvre* (juniper), from the fact that the characteristic flavoring ingredient of the spirit is juniper berries. Gin was originally and is still largely a Dutch compounded liquor, but it has long been a favorite stimulant beverage with the lower orders in London and other large English towns; and it is manufactured on a great scale by English rectifiers. As each separate dis-

tiller varies to some extent the materials and proportions of ingredients used in the preparation of gin, the varieties of the beverage are numerous; but generally a clear distinction exists between Hollands or Dutch gin and English gin. In the manufacture of Hollands a mash is prepared consisting of say 112 pounds of malted bere or bigg and 228 pounds of rye meal, with 460 gallons of water, at 162° Fahr. After infusion a proportion of cold water is added; and when the heat is reduced to about 80°, the whole about 500 gallons, is run into the fermenting vat, to which about half a gallon of yeast is added. Fermentation speedily ensues, and in about two days the attenuation is complete, although at this stage nearly one-third of the saccharine matter in the liquor is undecomposed. The special features of the fermentation are the small proportion of yeast employed and the imperfect attenuation of the worts. The wash so obtained is distilled, and the resulting low wine is redistilled, with the addition of juniper berries and a little salt, sometimes with the addition of hops. Dutch gins vary much one from another, but generally they are much purer and mellower liquors than the more highly flavored and frequently adulterated British gins.

GINCKELL, GODART VAN, first earl of Athlone, general, was born in Guelderland about 1630 or 1640, and died in 1703. In 1690 Ginkell accompanied William III. to Ireland, and commanded a body of Dutch cavalry at the battle of the Boyne. On the king's return to England General Ginkell was intrusted with the conduct of the war. He took the field in the spring of 1691, and established his headquarters at Mullingar. Among those who held a command under him was the marquis of Ruigny, the recognized chief of the Huguenot refugees. Early in June Ginkell took the fortress of Ballymore, capturing the whole garrison of 1,000 men. The English lost only eight men. After reconstructing the fortifications of Ballymore, the army marched to Athlone, then one of the most important of the fortified towns of Ireland. The Irish defenders of the place were commanded by a distinguished French general, Saint-Ruth. The firing began on June 19th, and on the 30th the town was stormed, the Irish army retreating toward Galway, and taking up their position at Aghrim. Having strengthened the fortifications of Athlone and left a garrison there, Ginkell led the English, on July 12th, to Aghrim. An immediate attack was resolved on, and, after a severe and at one time doubtful contest, the crisis was precipitated by the fall of Saint-Ruth, and the disorganized Irish were defeated and fled. A horrible slaughter of the Irish followed the struggle, and 4,000 corpses were left unburied on the field, besides a multitude of others lay along the line of the retreat. Galway next capitulated, its garrison being permitted to retire to Limerick. There the viceroy, Tyrconnel, was in command of a large force, but his sudden death early in August left the command in the hands of General Sarsfield and the Frenchman D'Usson. The English army came in sight of the town on the day of Tyrconnel's death, and the bombardment was immediately begun. Ginkell, by a bold device, crossed the Shannon and captured the camp of the Irish cavalry. A few days later he stormed the fort on Thomond Bridge, and after difficult negotiations a capitulation was signed, the terms of which were divided into a civil and a military treaty. Thus was completed the conquest or pacification of Ireland, and the services of the Dutch general were amply recognized and rewarded. He received the formal thanks of the House of Commons, and was created by the king first earl of Athlone and baron of Aghrim. The immense forfeited estates of the earl of Limerick were given to him, but the grant was a few

years later revoked by the English parliament. The earl continued to serve the English army, and accompanied the king to the Continent in 1693. He fought at Landen, and assisted in destroying the French magazine at Givet. In 1702 he took command of the Dutch serving under the duke of Marlborough. He died at Utrecht, February 10, 1705. On the death of the ninth earl without issue in 1844, the title became extinct.

GINGER, the rhizome or underground stem of *Zingiber officinale*, Roscoe, a perennial reed-like plant growing from three to four feet high. The flowers and leaves are borne on separate stems, those of the former being shorter than those of the latter, and averaging from six to twelve inches. The flowers themselves are borne at the apex of the stems in dense ovate, oblong, cone-like spikes from two to three inches long, composed of obtuse strongly-imbriated bracts with membranous margins, each bract inclosing a single small sessile flower. The leaves are alternate, bright green, smooth, tapering at both ends, with very short petioles. The plant, though unknown in a wild state, is considered with very good reason to be a native of the warmer parts of Asia, over which it has been cultivated from an early period, and the rhizome imported into England. From Asia the plant has spread into the West Indies, South America, western tropical Africa, and Australia.

The use of ginger as a spice has been known from very early times; it was supposed by the Greeks and Romans to be a product of southern Arabia, and was received by them by way of the Red Sea; in India it has also been known from a very remote period, the Greek and Latin names being derived from the Sanskrit. Marco Polo seems to have seen the ginger plant both in India and China between 1280 and 1290. John of Montecorvino, a missionary friar who visited India about 1292, gives a description of the plant, and refers to the fact of the root being dug up and transported. The spice is said to have been introduced into America by Francisco de Mendoza, who took it from the East Indies to New Spain. It seems to have been shipped for commercial purposes from San Domingo as early as 1585, and from Barbados in 1654; so early as 1547 considerable quantities were sent from the West Indies to Spain.

Ginger is known in commerce in two distinct forms, termed respectively coated and uncoated ginger, as having or wanting the epidermis. For the first, the pieces, which are called "races" or "hands," from their irregular palmate form, are washed and simply dried in the sun. In this form ginger presents a brown, more or less irregularly wrinkled or striated surface, and when broken shows a dark brownish fracture, hard, and sometimes horny and resinous. To produce uncoated ginger the rhizomes are washed, scraped, and sun-dried, and are often subjected to a system of bleaching, either from the fumes of burning sulphur or by immersion for a short time in a solution of chlorinated lime. The whitewashed appearance that much of the ginger has, as seen in the shops, is due to the fact of its being washed in whiting and water, or even coated with sulphate of lime. This artificial coating is supposed by some to give the ginger a better appearance; it often, however, covers an inferior quality, and can readily be detected by the ease with which it rubs off, or by its leaving a white, powdery substance at the bottom of the jar in which it is contained. Uncoated ginger, as seen in trade, varies from single joints an inch or less in length to flatfish, irregularly branched pieces of several joints, the "races" or "hands," and from three to four inches long; each branch has a depression at its summit showing the former attachment of a leafy stem. The color, when not whitewashed is a pale buff; it is

somewhat rough or fibrous, breaking with a short mealy fracture, and presenting on the surfaces of the broken parts numerous short bristly fibers.

The principal constituents of ginger are starch, volatile oil (to which the characteristic odor of the spice is due), and resin (to which is attributed its pungency). Its chief use is as a condiment or spice, but as an aromatic and stomachic medicine it is also used internally. "The stimulant, aromatic, and carminative properties render it of much value in atonic dyspepsia, especially if accompanied with much flatulence, and as an adjunct to purgative medicine to correct griping." Externally applied as a rubefacient, it has been found to relieve headache and toothache. The rhizomes, collected in a young, green state, washed, scraped, and preserved in syrup, form a delicious preserve, which is largely exported from the West Indies and from China. Cut up into pieces like lozenges, and preserved in sugar, ginger also forms a very agreeable sweetmeat.

GINGHAM is a woven cotton fabric, of a close, stoutish texture, the distinguishing characteristics of which are that it is a plain (*i. e.*, untwilled) cloth, woven into yarn-dyed stripes or checks of two or more colors. In some cases as many as seven or eight colors are introduced in the warp and weft of a gingham; but no patterns are made that cannot be woven in a common plain loom. Gingham was originally an Indian product, but its manufacture was early introduced into the Lancashire and Glasgow districts; and during the first half of the present century the trade formed an important feature in the textile industries of the latter locality — the demand for the fabric coming chiefly from the United States and the West Indies. The trade distinction of gingham is now to a large extent superseded by other terms.

GINGKO (*Gingko biloba*, or *Salisburia adiantifolia*) is the Japanese name of a coniferous tree of the yew alliance (*Taxace*), with very characteristic leaves, in form and variation recalling the leaflets of the maiden hair ferns. The yellow drupe-like seeds reach the size of a walnut, and are largely eaten throughout China and Japan; the chestnut-like kernels are roasted like chestnuts, and also yield a wholesome oil. The Japanese esteemed the trees as sacred, and planted it round their temples. Being a free-grower, and having been introduced in the eighteenth century, large trees are now not uncommon in Europe, nor in America, where they were introduced in 1784. The tree is dioecious, but the Chinese sometimes plant several male and female trees close together, so that male and female flowers appear to arise on the same tree.

GINGUENE, PIERRE LOUIS, the author of the *Histoire littéraire d'Italie*, was born April 25, 1748, at Rennes in Brittany. He was nominated one of the commission charged to continue the literary history of France, which had been brought down by the Benedictines to about the close of the twelfth century; and the three volumes of this series which appeared in 1814, 1817, and 1820 are, for the most part, the result of his labors. But the work by which Ginguéné will be longest remembered is his *Histoire littéraire d'Italie* (nine vols. 8vo, 1811–1819), to which he was putting the finishing touches when he was cut off by a painful disease, November 16, 1815.

GINSENG, the root of a species of *Panax*, belonging to the natural order *Araliaceae*, is a very celebrated Chinese medicine. The demand is so great that many other roots are substituted for it, notably that of *Panax quinquefolium*, Linn., distinguished as American ginseng, and imported from the United States. At one time the ginseng obtained from Manchuria was considered to be the finest quality, and in consequence be-

came so scarce that an imperial edict was issued prohibiting its collection. That prepared in Corea is now the most esteemed variety. The root of the wild plant is preferred to that of cultivated ginseng, and the older the plant the better is the quality of the root considered.

Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from two to four inches.

GIOBERTI, VINCENZO, the ablest philosophical writer of modern Italy, and one of the most interesting actors in the recent history of the country, was born in Turin on April 5, 1801, the only child of parents in modern circumstances there, and was educated by the fathers of the Oratory with a view to the priesthood, to which he was ordained in 1825. The freedom of Italy from foreign masters became his ruling motive in life, and this freedom in his conception of it was an emancipation, not only from armed masters, but from modes of thought alien to its genius, and detrimental to its European authority. His popularity and private influence were reasons enough for the court party to mark him for exile; he was not of them, and could not be depended on. Knowing this, he in 1833 asked permission to resign his chaplaincy, to which he was appointed in 1831 by King Charles Albert, but was suddenly arrested while walking with a friend in the public gardens, and, after an imprisonment of four months, sent out of the country in the escort of a carabineer, under decree of banishment. With broken fortunes and ruined plans Gioberti arrived in Paris in the beginning of October, 1833. A year later he went to Brussels, where he spent the best period of his life from that time to 1845, teaching philosophy, and assisting in the work of a college. His spirits never returned to him, however, as his whole being was bound up with the welfare of his native country. An amnesty having been passed by Charles Albert in 1846, Gioberti had liberty to return to Italy, just as Pius IX. in the beginning of his pontificate manifested strongly liberal sympathies. Gioberti took no step, however, till the end of 1847, and did not return to his native land till after certain negotiations, and the public expression of popular enthusiasm in his favor. On his entrance into Turin, April 29, 1848, there was a general outburst of this enthusiasm, mainly caused, it appears, by his unjust banishment and by the large circulation of his books, especially the *Gesuita Moderno*. The king made him senator, but, having been returned both by Turin and by Genoa as deputy to the assembly of representatives, now first meeting under the new constitution, he elected to sit in the lower chamber, for his native town. Previous to the opening he made a tour in various provinces. While he was engaged in this tour, constantly addressing the people publicly, the chamber met and elected him president. In the same parliament sat Azeglio, Cavour, and other liberals, and Balbo was prime minister. At the close of the same eventful year, a new ministry was formed, headed by Gioberti; but with the accession of Victor Emmanuel in March, 1849, his active life came to an end. He died suddenly, of apoplexy, on October 26, 1852.

GIOJA, MELCHIOR, a distinguished Italian writer on philosophy and political economy, was born at Piacenza in 1767, and died in 1828.

GIORDANO, LUCA, a painter of great immediate celebrity, was born in Naples, son of a very indifferent painter, Antonio, who imparted to him the first rudiments of drawing. Nature predestined him for the art, and at the age of eight he painted a cherub into one of his father's pictures, a feat which was at once noised

abroad, and which induced the viceroy of Naples to recommend the child to Spagnoletto. His father afterward took him to Rome, to study under Pietro da Cortona. He acquired the nickname of Luca Fa-presto (Luke Work-fast). His rapidity, which belonged as much to invention as to mere handiwork, and his versatility, which enabled him to imitate other painters deceptively, earned for him two other epithets, "The Thunderbolt (Fulmine), and "The Proteus," of Painting. Charles II. of Spain toward 1687 invited him over to Madrid, where he remained thirteen years. Giordano was very popular at the Spanish court, being a sprightly talker along with his other marvelously facile gifts, and the king created him a cavalier. One anecdote of his rapidity of work is that the queen of Spain having one day made some inquiry about his wife, he at once showed Her Majesty what the lady was like by painting her portrait into the picture on which he was engaged. After the death of Charles in 1700 Giordano, gorged with wealth, returned to Naples. He spent large sums in acts of munificence, and was particularly liberal to his poorer brethren of the art. He again visited various parts of Italy, and died in Naples on January 12, 1705.

GIORGIONE, the name adopted both by his contemporaries and by posterity for one of the most renowned of Italian painters, signifies George the Big, or Great, and was given him, according to Vasari, "because of the gifts of his person and the greatness of his mind." He was born in or shortly before the year 1477. In histories and catalogues he is now commonly styled Giorgio Barbarella of Castelfranco. His active career cannot have extended over more than fifteen years, since we know that he died in 1511, — according to one account, of a contagious disorder; according to another, of grief at discovering that his mistress had played false with a pupil. But in that brief career he had both deeply modified the older manner of the Venetian school, as represented even by a master so great and so austere as John Bellini, and had prepared the way for its final manner, as represented by the most complete master of all, Titian. Bellini, who outlived Giorgione, had not been ashamed to learn something from the practice of a teacher fully forty years younger than himself, who was probably in the first instance his own pupil. Titian, only ten years younger than Giorgione, succeeded to his conquests, and enjoyed the length of days which was denied him.

GIOTTINO, an early Florentine painter. Vasari is the principal authority in regard to this artist: but it is not by any means easy to bring the details of his narrative into harmony with such facts as can be verified at the present day. It would appear that there was a painter of the name of Tommaso (or Maso) di Stefano, termed Giotto; and the Giotto of Vasari is said to have been born in 1324, and to have died early, of consumption, in 1357 — dates which must be regarded as open to considerable doubt. It is even said that Giotto was really the son (others say the great-grandson) of Giotto. To Maso di Stefano, or Giotto, Vasari and Ghiberti attribute the frescoes in the chapel of S. Silvestro (or of the Berdi family) in the Florentine church of S. Croce. These works are animated and firm in drawing, with naturalism carried further than by Giotto. From the evidence of style, some modern connoisseurs assign to the same hand the paintings in the funeral vault of the Strozzi family, below the Cappella degli Spagnuoli in the church of S. Maria Novella, representing the crucifixion and other subjects. Vasari ascribes also to his Giotto the frescoes of the life of St. Nicholas in the lower church of Assisi. This series, however, is not really in that part of the church which

Vasari designates, but is in the Chapel of the Sacrament; and the works in that chapel are understood to be by Giotto di Stefano, who worked in the second half of the fourteenth century — very excellent productions of their period. It might, hence, be inferred that two different men produced the works which are unitedly fathered upon the half-legendary "Giotto," the consumptive youth, solitary and melancholic, but passionately devoted to his art. A large number of other works have been attributed to the same hand.

GIOTTO, relatively to his age one of the greatest and most complete of artists, fills in the history of Italian painting a place analogous to that which seems to have been filled in the history of Greek painting by Polygnotus. That is to say, he lived at a time when the resources of his art were still in their infancy, but considering the limits of those resources, his achievements were the highest possible. At the close of the Middle Age, he laid the foundations upon which all the progress of the Renaissance was afterward securely based. In the days of Giotto, the knowledge possessed by painters of the human frame and its structure rested only upon general observation, and not upon any minute, prolonged, or scientific study; while to facts other than those of humanity their observation had never been closely directed. Of linear perspective they possessed few ideas, and those elementary and empirical, and scarcely any ideas at all of aerial perspective or the conduct of light and shade. As far as painting could ever be carried under these conditions, so far it was carried by Giotto. He is one of the least one-sided of artists, and his art, it has been justly said, resumes and concentrates all the attainments of his time not less truly than all the attainments of the crowning age of Italian art are resumed and concentrated in Raphael. In some particulars the painting of Giotto was never surpassed, — in the judicious division of the field and massing and scattering of groups, — in the union of dignity in the types with appropriateness in the occupations of the personages — in strength and directness of intellectual grasp and dramatic motive, — in the combination of perfect gravity with perfect frankness in conception, and of a noble severity in design with a great charm of harmony and purity in color. His is one of the few names in history which, having become great while its bearer lived, has sustained no loss of greatness through subsequent generations.

Giotto di Bondone (a name, as it happens, also borne in the same generation by a distinguished citizen of Siena) was the son of a poor peasant of Vespignano. He was born in 1276, and drew, we are told, by natural instinct with whatever materials he could lay his hands on. He was ten years old when Cimabue, as the story goes, found him by the wayside, drawing a sheep with a piece of charcoal upon a stone or tile. The master, then at the height of his fame, took the peasant boy, with the glad consent of his father, to Florence to be his pupil. Of his early career after this we know no more until we find him at work as the foremost among many scholars employed under Cimabue at the interior decorations of the great memorial church of St. Francis at Assisi. Some interval (but the chronology of Giotto's career is at all points obscure) would seem to have elapsed between the execution of these frescoes and of others, better known than these, which adorn the lower story of the same structure. In four lunette-shaped spaces in the vaulting of this lower church, Giotto has painted four vast compositions, of which the scheme was dictated to him, no doubt, by some pious and learned mouthpiece of the wishes of the order. One of these exhibits the mystical wedding of Francis with Poverty; a second is an allegory of Chastity; a third

of Obedience; a fourth shows the saint glorified in heaven among the angels. To describe and explain these famous compositions would be beyond our scope. The ideas they embody cannot but seem strained and cold when we express them in modern language. Strained and cold, indeed, the ideas would have been in any other age of the world; but we must remember that the religious temperament of that age in Italy gave even to pedantry the colors of passion, and an ardent and solemn reality to the most far-drawn fantasies of devotion. And however cool the private judgment of Giotto in such matters may have been, it is not his private judgment which speaks to us from the painted allegories of Assisi; it is the sincere imagination of the men among whom he lived; it is the ardent and solemnity of the devotional spirit of his race. In one of the transepts of the same lower church there are frescoes of the Passion of Christ, and others of the life of St. Francis, which modern authorities hold against ancient, most likely with justice, to be also from the hand of Giotto.

Assuming that the later work of the master at Assisi belongs to the year 1296, or thereabout, we have good evidence that two years afterward he was working at Rome for the Cardinal Stefaneschi, nephew of Pope Boniface VIII. The remains of his industry in this employment may be seen in a mosaic of the *Navicella*, or Christ saving St. Peter from the waves, now preserved in the portico of St. Peter's at Rome, and in three panels, kept in the sacristy of the canons of the same church, which originally formed part of a ciborium. It is also recorded that Giotto adorned certain MSS. with miniatures for this patron; and in truth there exists in public libraries a very rare class of MSS., in which the miniatures bear the marks, if scarcely of the hand, at any rate of the immediate influence of Giotto. Lastly, a discolored fragment of a fresco of the church of St. John Lateran, shows the figure of Pope Boniface VIII. announcing from a balcony the opening of the famous jubilee of the year 1300. Soon after this, Giotto was once more in his native city. Recent research has again thrown in doubt the relative shares of the master and of his pupils in the decorations of the chapel, called by Ghiberti the chapel of the Magdalene, in the Bargello or palace of the Podestà at Florence. These were painted to celebrate the pacification between the black and white parties in the state, effected by the Cardinal d'Acquasparta as delegate of the Pope in 1302, and consisted of a series of Scripture scenes, besides great compositions of hell and paradise. It is in the paradise that the painter has introduced those groups, typical of pacified Florence, in which occur the portraits of Dante, Brunetto Latini, and Corso Donato, and which, amid the emotion of all who care for art or history, were recovered in 1841 from the whitewash that had overlain them.

The whole central period of Giotto's life, from about 1305 to about 1334, is divided between periods of residence at Florence and expeditions, of which we can in very rare instances trace the date or sequence, undertaken in consequence of commissions received from other cities of the peninsula. He was as much or more of a traveler as was Van Eyck a century later; and his travels exercised as much or more of the same fertilizing and stimulating influence on art in Italy as did those of the great Fleming in the northwest of Europe. The familiar story of the O belongs to a journey to France, which was projected by Giotto but never undertaken. Pope Benedict XI., the successor of Boniface VIII., sent a messenger to bring him proofs of the painter's powers. Giotto would give the messenger no other sample of his ~~talent~~ than an O drawn with a free sweep of the brush

from the elbow; but the pope was satisfied, and engaged Giotto at a great salary to go and adorn with frescoes the papal residence at Avignon. Benedict, however, dying at this time (1305), nothing came of this commission; and the Italian fourteenth century frescoes, of which remains are still to be seen at Avignon, have been proved to be the work, not, as was long supposed, of Giotto, but of the Siennese master, Simone Martini, called Simone Memmi. Another certain date in Giotto's career belongs to the close of the period we have defined. In 1328 he had painted in the palace of Signoria at Florence a portrait (now lost) of Charles of Calabria kneeling before the Virgin. Two years later he was invited by the father of this prince, King Robert of Naples, to come and work for him in that city. Some frescoes in the chapel of the Incoronata had been long erroneously supposed, on the authority of Petrarch, to represent a part at any rate of the industry of Giotto during the three years which he spent at Naples. It is the merit of Messrs. Crowe and Cavalcaselle, while conclusively setting aside this tradition, to have called attention to a real and very noble work of the master existing in a hall which formerly belonged to the convent of Sta. Chiari in that city. This is a fresco celebrating the charity of the Franciscan order under the figure of the miracle of the loaves and fishes, with the personages of St. Francis and St. Clare kneeling on either hand.

Between these two dates (1305 and 1330), Giotto is said to have resided and left great works at Padua, Ferrara, Urbino, Ravenna, Rimini, Faenza, Lucca, and other cities; and in several of these paintings are still shown which bear his name with more or less of plausibility. But among them it is at Padua only that his authentic and mature powers can really be studied, and that in perhaps the greatest and most complete series of creations of all that he has left. These are the frescoes with which he decorated the chapel built in honor of the Virgin or the Annunciation by a rich citizen of the town, Enrico Scrovegni, and called sometimes the chapel of the Arena, because it is on the site of an ancient amphitheater. Since it is recorded that Dante was Giotto's guest at Padua, and since we know that it was in 1306 that he came from Bologna to that city, we may conclude that to the same year, 1306, belongs the beginning of Giotto's great undertaking in the Arena chapel. The scheme includes a Saviour in Glory over the altar, a Last Judgment over the entrance door, and on either side a series of subjects from the Old and New Testaments and the apocryphal Life of Christ, painted in three tiers, and lowest of all, a fourth tier with emblematic Virtues and Vices in monochrome, the Virtues being on the side of the chapel which is next the incidents of redemption in the entrance fresco of the Last Judgment, the Vices on that side which is next the incidents of perdition. There is no other single building, or single series of representations, in which the highest powers of the Italian mind and hand at the beginning of the fourteenth century may be so well studied as here.

Meantime, Giotto had been advancing, not only in fame, but in years and in prosperity. He was married young, and had, so far as is recorded, three sons, Francesco, Nicola, and Donato, and three daughters, Bice, Caterina, and Lucia. He had added by successive purchases to the plot of land inherited from his father at Vespignano. His fellow-citizens of all occupations and degrees delighted to honor him. And now, in his fifty-eighth year, on his return from Naples by way of Gaëta, he received the final and official testimony to the esteem in which he was held at Florence. By a solemn decree of the Priori (April 12, 1334), he was appointed master of the works of the cathedral of Sta. Reparata (subsequently and better known as Sta. Maria del Fiore), and

architect of the city walls and of the towns within her territory. Dying in 1336, he only enjoyed these dignities for two years. But in the course of these two years he had found time not only to make an excursion to Milan, on the invitation of Azzo Visconti and with the sanction of his own Government, but to plan and in part to superintend the execution of two monuments of architecture, of which the one remaining is among the most exquisite in design and richest in decoration that were ever conceived by man. These were, the west front of the cathedral, and its detached campanile or bell tower. The cathedral front was barbarously stripped of its enrichments in a later age, and stood naked until the other day, when the city of Florence undertook to restore it in a modern imitation. The campanile remains, except for inconsiderable repairs, as it was left by the pupils of Giotto after their master's death; and in the consummate dignity as well as consummate delicacy of its design, in its fair proportions and in the opulent but lucid invention and apportionment of its details, in the thoughtfulness and pregnant simplicity of its sculptured histories, it is the most fitting crown and monument of a strong and memorable career.

GIOVINAZZO, a town of Italy, in the province of Bari, about eleven miles from Bari, on the railway from Otranto to Bologna.

GIOVIO, PAUL. See JOVIUS.

GIPIES, a wandering folk scattered through every European land, over the greater part of Asia and North America, and along the northern coast of Africa. No general estimate can be formed of their numbers outside Europe, but travelers agree that they are very numerous in Persia, Armenia, Asiatic Turkey and Egypt, while in America, besides a multitude of British Gipsies, Gipsies from Spain, France, Germany and Hungary are not unfrequent. The total, 700,000, at which Miklosich placed (1878) the European Gipsies, fairly agrees with the following fragmentary statistics. Turkey, before its dismemberment, contained 104,750 (9,537 in Bosnia and the Herzegovina in 1874); Servia had 24,691 in 1874; Montenegro, 500 in 1873; and in Roumania there are from 200,000 to 300,000, according to the varying estimates of Cretulesco (1876) and the *Annuaire général officiel de Roumanie* (1874). In 1876 Austria counted about 1,000 (13,500 in Bohemia in 1846?), and Hungary 159,000 (78,923 in Transylvania in 1850, and 36,842 in Hungary proper in 1864); while Spain is credited with 40,000, France with from 2,000 to 6,000 (700 in the Basque country), Germany and Italy together with 34,000(?), and Scandinavia with 1,500. In Russia their number in 1834 was stated at 48,247, exclusive of Polish Gipsies; in 1844 at 1,427,539, and in 1877 at 11,654.

Just as in every European land the Gipsy calls "Gentiles" (*i. e.*, non-Gipsies) *gaijé*, he calls himself *Rom*, "a man or husband." This word *Rom*, connected by Paspatis with the name of the Indian god *Rāma*, is, by Miklosich, identified with the Sanskrit *doma* or *domba*, "a low-caste musician." Of names conferred by "Gentiles," some point to the fancied cradle of the Gipsy race. Thus *Gipsy* or *Gypsy* itself (*Egyptian* in the sixteenth century), the Spanish *Gitano*, Albanian *Tevk*, modern Greek *Ψάρος* (*Gyphos*), Magyar *Pharao népek* ("Pharaoh's people"), and Turkish *Fārāwīn*, preserve the belief in its Egyptian origin, a belief which finds no confirmation except in the casual resemblance between *Rom* and the Egyptian *rōme*, "man," and which was possibly due to the Gipsies' skill in serpent-charming. The Scandinavian and Low-German *Tatave* identifies Gipsies with the Mongolian hordes, the terror of Europe in the thirteenth century; and their French name, *Bohémiens*, was probably due either to a confusion of some *vach* form as *Secani* with *Czech*, or to the belief that

Gipsies originated in Bohemia. Other names again denote the character, hue or callings of the race, as Arabic *Harāmī*, "villain;" Dutch *Heydens*, "heathens;" Persian *Kardchi*, "swarthy." Their Scotch name *Tinkler*, which occurs in a charter of William the Lion (1165-1214), is commonly held to be a mere variant of *tinker*; but if its initial *t* corresponds to *z* (*cf.* English *ten*, German *zehn*), it comes very near the Italian *Zingaro* or *Zingano*, which, like the German *Zigeuner*, Czech *Cin-gán* or *Cigán*, and Magyar *Cigány*, is a form of the most widespread of all the Gipsies' appellations—Bulgarian *Atzigan*, modern Greek *Ατζίγκανος* (*Atsigkanos*) or *Αβίγγανος* (*Athigganos*).

First Appearance in European History.—From whatever cause, it is certain that a confusion did exist between the *Ατζίγκανος* and *Αβίγγανος*, which renders it extremely difficult to determine whether the Byzantine historians are speaking of Gipsies or heretics in seven passages collected by Miklosich. It appears from these that *Αβίγγανος*, described as magicians, soothsayers, and serpent-charmers, first emerge in Byzantine history under Nicephorus I. (802-11), were banished by Michael I. (811-13), and were restored to favor by Michael II. (820-29); but Miklosich's reasons for absolutely identifying them with Gipsies, and positively asserting the latter to have appeared at Byzantium in 810 under Nicephorus, are hard to recognize. Less dubious seems an extract from the Georgian *Life of Giorgi Mtharsmindel* (eleventh century), which describes how at Constantinople certain descendants of the race of Simon Magnus, *Atsinkan* by name, sorcerers and famous rogues, slew wild beasts by their magic arts in the presence of Bagrat IV. Such passages are open to some doubt; hardly so the following from the *Itinerarium Symonis Simeonis* (ed. by J. Nasmith, Camb. 1778), where Fitz Simeon, a Franciscan friar of Dublin, describing his stay in Crete in 1322, says: "We there saw a people living outside the city (of Candia), who worship according to the Greek rite, and declare themselves of the race of Ham. They rarely or never stop in one place more than thirty days, but, as though accursed of heaven, wander from field to field with little, oblong, black, low tents, like those of the Arabs, or from cave to cave." The empress Catherine de Valois, again, who died in 1346, granted to the suzerains of Corfu authority to reduce to vassalage certain *homines vageniti* coming from the mainland, who under the Venetians formed in 1386 the nucleus of a *feudum Acinganorum* that lasted down to the present century. About 1378 the Venetian governor of Nauplion confirmed the *Acin-gani* of that Greek colony in privileges granted by his predecessors; and in 1387 Mircea I., waiwode of Wallachia, renewed a grant made by his uncle Ladislav to the monastery of St. Anthony at Voditza of forty *salaschi* (tents) of *Acigani*. Other documents might be cited, but these are enough to show that in the fourteenth century Gipsies existed in the Balkan peninsula and islands of the Levant; that in Wallachia they were reduced to a state of bondage (from which they were only freed in 1856); and that nowhere were they regarded as newcomers, so that by these documents it is impossible to fix the date of the first Gipsy immigration. More than this, a metrical German paraphrase of Genesis, made by an Austrian monk about 1122, preserved at Vienna, and edited by Hoffmann in his *Fundgruben für Geschichte deutscher Sprache* (Breslau, 1837), goes far to prove that Gipsies were known in Austria three centuries before the commonly-accepted date of their appearance in that country. A passage relating to Hagar's descendants (Gen. xvi. 15) runs: "So she (Hagar) had this son; they named him Ishmael. It is from him the Ishmaelites descend. They journey

far through the world; we call them *chaltsmide* (lit. cold-smiths). * * * They have no house nor country; everywhere they are found alike; they wander over the country, abusing people by their knaveries. Thus they deceive men,—robbing no one openly." That here by *chaltsmide*, *Ishmaelites*, and *descendants of Hagar* Gipsies are meant, scarcely admits of doubt, seeing that the smith's is still the Gipsies' leading handicraft; that Lusignan in 1573 speaks of the Gipsies of Cyprus as "Cinques, otherwise called *Agariens*;" and that in German and Danish *Rotwälsch* or thieves' slang *Geschmeilim* and *Smaelem* (i.e., *Ishmaelites*) signify "Gipsies." The *κωμοδρόμοι* also of Byzantine writers were possibly Gipsies, being defined by Ducange as "circulatores atque adeo *Fabri erarii* qui per pagos cursitant: ut hodie passim apud nos, quos *Chaudronniers* dicimus." Theophanes (758–818) speaks under the date 544 of a *κωμοδρόμος* from Italy.

Later Movements.—Late in 1417 there came to Lüneburg a band of 300 wanderers, "black as Tartars and calling themselves *Secani*." At their head rode a "duke" and "count," splendidly dressed, and leading like nobles dogs of chase; next came a motley crew afoot; and women and children brought up the rear in wagons. They bore among other letters of safe-conduct one granted by the emperor Sigismund, and professed themselves engaged on a seven years' pilgrimage, imposed by their bishops in expiation of apostasy from the Christian faith. From Lüneburg they passed to Hamburg, Lübeck, Wismar, Rostock, Stralsund, and Greifswald, camping by night outside the walls, thieving by day, "wherefore several were taken and slain" (cf. the contemporary annals of Korner and Rufus, and Krantz's *Saxonia*, 1520). In 1418 they journeyed southward through Meissen, Leipsic, and Hesse, and, entering Switzerland, arrived at Zurich on August 31st, visiting also Basel, Bern, and Solothurn, according to Conrad Justinger (died 1426), who speaks of them as "more than 200 baptized heathens from Egypt." They now split up into two bands, the first of which appeared before Augsburg (November 1, 1418), the second before Sisteron in Provence (October 1, 1419), where the terrified citizens bestowed on the "Saracens" a hundred leaves. Next comes a long notice of a troop of fully one hundred lean, black, hideous Egyptians, in the *Chronica di Bologna* (July 28, 1422), which tells how the sorceress, "Duke" Andrew's wife, could read the past and future of men's lives; but Bologna, in fifteen days, became too hot for them, so, by way of Forlì—where "certain said they were from India"—the pilgrims traveled on to Rome. Their object was to procure fresh letters from the pope; and such they afterward produced, though of their sojourn in the imperial city no record has yet been published. To the burghers of Ratisbon Gipsies presented themselves in 1424; they pitched their tents again before its walls in 1426; and at Paris, in 1427, the fair of Landit was attended by a duke, a count, and ten other mounted pilgrims, late renegades of "Lower Egypt," whose women practiced palmistry and cleared everybody's pockets. Later we hear of Gipsies at Arnheim (1429), at Metz (1430), at Erfurt (1432), and in Bavaria (1433)—these and all notices of the seventeen years preceding referring probably to the movements of a single ubiquitous band, sent forward to spy out the lands of promise, and composed of from 600 to 1,400 persons. For not until 1438 did the great tide of westward immigration begin to flow; then, not in hundreds but thousands, headed no longer by paltry "dukes" and "counts," but by a "king," King Zindl, the Gipsies poured over Germany, Italy and France, reaching Poland by 1501, Sweden by 1512, and, having already

appeared in Spain in 1447, we find them in England in 1514 (*A Dialogue of Syr Thomas More*, 1529), but nothing is known of the date of their landing; and in Scotland the earliest certain record of their presence is an entry in the books of the Lord High Treasurer, "April 22, 1505. Item, to the Egyptianis, be the kingis command, vij. lib." (Pitcairn's *Criminal Trials*, Edinburgh, 1833, vol. iii., p. 592.) In a "King of Rowmais" (? *Kómas*, Gipsies), twice mentioned in entries of July, 1492, as also in the "Erle of Greece" (1502), "King Cristall" (1530), and the "King of Cipre" (1532), one dimly recognizes four Gipsy chiefs; and with Gipsies perhaps the Saracens may be identified, whom a tradition represents as making depredations in Scotland prior to 1,460 (Simson, p. 98). In no other country were Gipsies better received than in this, where they "dantsit before the king in Halyrudhous" (1530); where James IV. gave (July 5, 1505) Anthonius Gagno, count of Little Egypt, a letter of commendation to the king of Denmark, and where James V. subscribed a writ (February 15, 1540) in favor of "oure louit Johnne Faw, lord and erle of Littill Egipt," to whose son and successor he granted authority to hang and punish all "Egyptians" within the realm (May 26, 1540). But in 1541 an Act was passed, commanding the "Egyptians to pass forth of the realm" under pain of death, and similar edicts were issued before and afterward in most of the European states—Germany (1497), Spain (1499), France (1504), England (1531), Denmark (1536), Moravia (1538), Poland (1557), etc. Conveying across the sea was among the milder measures adopted; it is, however, noteworthy as one of the causes of the dispersion of the tribes. Under Henry VIII. gipsies were shipped from England to Norway (Wright's *History of Ludlow*, pp. 389–92) or France; while by the latter power, so lately as 1802, the bands infesting Bayonne and Mauleon were caught by night as in a net, huddled on shipboard, and landed on the coast of Africa (Michel, *Pays Basque*, p. 137). In Scotland four Faas were hanged at Edinburgh in 1611 "for abiding within the kingdom, they being Egyptians;" and in 1636 doom was pronounced on other "Egyptians" at Haddington, the "men to be hangit, and the women to be drowned; and such of the women as hes children to be scourgit throw the burgh and brunt in the cheeke." Under the English statue of 1562 (repealed 1783) making it felony without benefit of clergy to be merely seen for a month in the fellowship of Gipsies, five men were hanged at Durham "for being Egyptians," August 8, 1592. Still greater were the cruelties and injustice suffered by the Gipsies on the Continent, since there, to the charge of kidnaping, were added the weightier imputations of being cannibals and emissaries of the Turk. Quiñones recounts how in 1629 four Estremaduran Gitanos owned under torture to have eaten a friar, a pilgrim, and a woman of their tribe; and in 1782 forty-five Hungarian Gipsies were beheaded, quartered, or hanged on a like monstrous charge. First racked till they confessed the crime of murder, they were brought to the spot where their victims were said to be buried, and when no bodies appeared, they were racked again. "We ate them," was their despairing cry; and forthwith the journals teemed with accounts of "eighty-five persons roasted by Gipsy cannibals;" straightway the "cannibals" were hurried to the scaffold. Then Joseph II. sent a commission down, whose inquiries showed that no one had been murdered—except the victims of the false accusation. The full, impartial annals of the race have still to be compiled, from edicts and law-books, from local histories and a few monographs like Dirk's *Geschiedkundige onderzoekingen aangaande het verblijf der Heidenen of Egyptiers in de Noordelijke Nederlanden*

(Utrecht, 1850), or Weber's *Zigeuner in Sachen*, 1488-1792, in volume ii. of his *Aus vier Jahrhunderten* (Leip. 1861).

Language.—Until lately the information about the Gipsy language to be gathered from books was meager in the extreme. The thirteen works published prior to 1840 which furnish specimens of the Anglo-Romani dialect, contain but three hundred and ninety-six genuine stems, besides sixty-nine doubtful words, and furnish scarcely any examples of the grammar. Nor are the Continental works cited by Pott, from Vulcanius (1589) downward, much more copious. Even to-day there are still great gaps in our knowledge, especially of the dialects outside of Europe; but enough has been done to show that from the Nile to the Arctic Ocean, from the Euphrates to the Atlantic, the Gipsies speak, with dialectal variations, one and the selfsame speech. The Romani names for "water," "fire," "hair," and "eye," are in Persia *pāni*, *ai*, *bāl* and *aki*; in Egypt *pāni*, *āg*, *bal*, and *ank-hi*; in Norway *pāni*, *jag*, *bal*, and *jak*; in England *pāni*, *yog*, *bal*, and *jok*. And these four instances, which might be multiplied indefinitely, serve further to show, by their resemblance to the Hindi *pāni*, *āg*, *bāl*, and *ānkhi*, that in Romani we have an Indian tongue. Rüdiger first compared Romani, so long regarded as a thieves' jargon, with one of the New Indian dialects. In 1783 Grellman's *Historischer Versuch* reaped all the fruits of Rüdiger's research; and in the same year Marsden was independently led to a like discovery. The conclusion that the Gipsies wandered forth from India is now almost universally accepted, but when or from what part of India, are questions on which few have done more than idly speculate. Whether Romani is derived from Hindi, Marathi, etc., can only be determined by minute investigations, which, long neglected, are now being carried on by various Orientalists. They have at least established that Romani stands in the relation of a sister, not a daughter, to the seven principal New Indian dialects.

In Europe Miklosich distinguishes thirteen Romani dialects—the Greek or Turkish, Roumanian, Hungarian, Moravo-Bohemian, German, Polo-Lithuanian, Russian, Finnish, Scandinavian, Anglo-Scottish, Italian, Basque, and Spanish. To these should be added the Welsh, which, generally unintelligible to the English Gipsy, is one of the most perfect, as it has also been the least studied, of all the dialects. As a general rule, the further these dialects remove from Turkey, the more corrupt have they become, so that Gipsies of Spain, of Scandinavia, and in great measure of England, know no case or verb endings other than those of the lands of their adoption.

The Romani vocabulary reveals positively and negatively the route by which the Gipsies must have entered Europe, and the various ways by which they have since dispersed to their present quarters. The absence, for instance, of Arabic elements from every European dialect disproves a common belief that the earliest immigrants may have landed in the Balkan peninsula from Egypt. On the other hand, the presence of Persian and Armenian words shows that they must have traversed and halted in the lands where those languages are spoken.

The Gipsies have no literature worthy of the name—nothing but some rude ballads, some love and dance songs, and a considerable mass of folk-tales. Valuable from a linguistic point of view, the songs have little merit of their own, and seem to be mainly echoes of Gentile strains. The folk-tales, however, would possibly repay a keener investigation than they have yet received. Alike in Wales and Turkey they may be identified with those of other Aryan races; scarce one has

yet been published but its counterpart may be found in Grimm's, Ralston's or other collections of European folk-lore. This resemblance of Romani to Gentile stories may be explained (1) by the common origin of the Aryan races, (2) by the Gipsies having borrowed from the nations among whom they wander, or (3) by these nations having received their stories from the Gipsies. Probably all three explanations are true by turns, but the first is sometimes excluded by an identity of details too close to have been preserved through untold ages, and as to the second it is hard to see how a story current at Paderborn should have traveled eastward to Constantinople, especially as Paspatis's tales, enshrining words and phrases otherwise obsolete, are plainly of some antiquity. Accordingly the third explanation, that the Gipsies may have carried those stories westward with them, deserves consideration. Some of the Gaelic stories collected by Campbell were, it should be remarked, taken down from Tinklers; and from a London Gipsy he obtained a version of *The Master Thief*, which is current also among Roumanian Gipsies. At present our information is far too scanty to warrant a definite conclusion; but could it once be shown that the Asiatic possess the same stories as the European Gipsies, it might be necessary to admit that Europe owes a portion of its folk-lore to the Gipsies.

"The Gipsies," says Grellmann, "brought no particular religion with them, but regulate themselves in religious matters according to the country where they live, * * * wherefore most writers place them below the heathens." This author notwithstanding, the Gipsies mix with their beginnings of Christianity or Mahometanism the relics of an older faith.

In Turkey, according to Paspatis, the nomad Tchighianés far outnumber the sedentary; but how far the same statement is true of Gipsies of other lands is hard to determine. Certain at least it is that in England few house-dwelling Gipsies are to be met with who do not remember that their forefathers followed a wandering life, or who do not themselves go temporarily under canvas as hop-picking or the great race-meetings come round. But though for centuries the tent has been the Gipsy's normal habitation, it would not seem to have been so always, if we look to the evidence of the Gipsy tongue. For had it been, assuredly the Romani name for "tent" would be everywhere the same, whereas the Persian Gipsy calls it *guri*, the nomad Tchighiané *katína*, the sedentary *tchérğa* (Turkish *cherkeh*), the Polish Gipsy *caater*, the German *tattin* (from *tatto*, "hot"), the English *tan*, etc. On the other hand, *ker*, "a house," occurs in every dialect. From the time, however, of Fitz-Simon onward Gipsies have everywhere been found dwelling in tents, and his description of these tents as "like those of the Arabs, low, black, and oblong," tallies with Mr. Boswell's:—

"The tents are made of rough blankets. They are nearly always brown ones, because the white blankets are not so good for the rain. First of all they measure the ground with a ridge-pole, then they take the kettle-prop and make the holes exactly opposite each other. Then they take up the ridge-pole and stick all the rods into it. Then there is a blanket that goes behind, and is pinned on with pin-thorns; next to that come the larger ones over the top of all, also pinned with the same pins."

In the matter of dress, gipsies formerly had a distinctive costume, consisting of a turban-like headdress of many colors, together with a large cloak, worn after the fashion of a toga, over a long, loose under-skirt. The Gipsies, however, of to-day can hardly be said to have a distinctive garb, though certain minutiae of dress still render them easily recognizable. In Transylvania.

for instance, their women's ear-rings differ in pattern from those of the natives; the Hungarian Gipsy chief wears silver buttons, bearing a serpent-crest; and his old-fashioned English brother decks his Newmarket coat with spade-guineas or crown-pieces. The English Gipsy woman may be known by her bright silk handkerchief, her curiously-plaited hair, her massy rings, her coral or bead necklace, and by the *monging-guno*, a tablecloth arranged bagwise over her back. In August, 1878, Queen Victoria was welcomed to Dunbar by a Gipsy "queen," one of the Reynolds family, who was "dressed in a black robe with white silk trimmings, and over her shoulders wore a yellow handkerchief. Behind her stood two other women, one of them noticeable from her rich gown of purple velvet, and two stalwart men, conspicuous by their scarlet coats." On the other hand, the dress of the children upon the Continent is simple, not to say scanty.

Everywhere Gipsies ply an endless variety of trades. In Egypt they monopolize the art of serpent-charming; in France and Spain they sit as professional models; in England we meet Gipsy Methodist preachers, actors, quack doctors, chimney-sweeps, carpenters, factory hands, etc. But everywhere the men have three principal callings—workers in metals, musicians and horse-dealers; everywhere the women are "pleasaut dauners" as in the days of Andrew Boorde, and by peddling and fortune-telling contribute their share—often more than their share—to the family purse. Gipsies have long been famous as copper and iron smiths in south-eastern Europe, where their horseshoes are reckoned unrivaled. Simson describes a primitive Tinkler method of smelting iron, and the caves of Granada still echo to the clink of Gipsy anvils; but in England the surname *petulengro*, "smith" (from *petul*, "horseshoe"), alone recalls the days when Gipsies surpassed the Gentile in the farrier's craft. Liszt ascribes to the Gipsies the creation of Hungary's national music. Bartalus (1868) contests the theory, but few would hesitate to admit its plausibility who at the Paris Exhibition (1878) or elsewhere have listened to the Gipsies' thrilling performance of a *czardas*, or are familiar with the undoubted compositions of Bihary, Csermak, and other Gipsy *maestri*. The Gipsy's favorite instrument is the violin, but few are the instruments he has not successfully essayed. The Eisteddfods of Wales have witnessed the triumphs of Gipsy harpists; and hundreds have been charmed by the concerts of the Roberts family, not knowing they were hearing a Gipsy band. "The Egyptians," as Krantzius dryly remarked in 1520, "frequently change their horses;" horse-dealing and horse-stealing are too often synonymous terms with them. Fortune-telling is on the wane with Gentiles' waning belief in the fortune-teller's powers. The Gipsy crone can no longer persuade the yeoman's wife to bury her treasure in the earth, and return in a fortnight's time to find it—gone. Those halcyon days of *madnzin* are passed by; the servant's hall is now the only El Dorado left. Enclosure Acts have struck a deadly blow at English Gipsydom, driving the wanderers from breezy common and turf-edged lane to the smoky suburbs of great town, or at best the outskirts of some watering place. Here, surrounded by Gentiles, the younger generation forget the wisdom of the Egyptians, relinquish time-honored customs, and, wedding with the sons and daughters of the land, widen the stream of Romani blood, and so diminish its "depth." Several accounts have been furnished of Romani marriages, but they rarely tally, and some (Bright's, Borrow's, and Simson's) do not bear quotation. On the Continent one common feature is the breaking by the chief of a flower-crowned pitcher, from whose fragments, as they are many or few, he

augurs the fortunes of the bridal pair. There are many curious Gipsy practices relating to death and burial, such as waking the corpse, burning the deceased's effects, the fasting of his kinsfolk, and a species of *tabu*. The earliest record of Gipsies burning the property of their dead occurs in the *Annual Register* for 1773: "The clothes of the late Diana Boswell, queen of the Gipsies, value £50, were burnt in the Mint, Southwark, by her principal courtiers, according to ancient custom." Much might be written of a kind of ceremonial purity prescribed by Gipsy law, and indicated in the language by the distinction between *chiklo*, "dirty," and *mokado*, "unclean." To wash a tablecloth with clothes is *mokado*, since it is connected with food; and a German Gipsy woman may not cook for four months after childbirth, while a vessel touched by the skirt of a woman's dress is held to be defiled. But with one other widespread practice we must take our leave of Gipsy customs, that, namely, of leaving at a cross-road a handful of grass or leaves, a heap of stones, a stick or some such mark to guide the stragglers of the band.

The Gipsy character, strange medley of evil and of good, presents itself as black and hateful to the outside world, whilst to the Romani race it is all that is fair and lovable. "There's nothing worse than mumply Gentiles" is a saying often in Gipsy mouths, which affords a clue to much that is puzzling in the Gipsy's nature. He is at war with mankind, for centuries his oppressors, and, all being fair in war, may plunder and beguile at will, so that he be not caught. Gipsies' light-heartedness and courtesy are patent to all men; but only to true or adopted members of the tribe are their inmost hearts revealed. Their principal faults are childish vanity, professional cunning, indolence (caused by the absence of ambition), and a hot passionate temper. But they are as ready to forgive as they are quick to resent a wrong; and before implicit confidence their cunning gives place to inviolate honor. Their family affection is intensely strong, prompting a parent never to chastise a younger child, a grown-up son meekly to take a thrashing from his father; and they are lavishly generous to such as are poorer than themselves, even though Gentiles. Their love of nature reveals itself in a hundred quaint, poetic phrases, in a familiarity with beasts and herbs; their love of dumb creatures in the number of their pets. Quick and versatile, all Gipsies readily adapt themselves to any state of life; they have so wonderful a gift of tongues that formerly it was reckoned against them for a proof of sorcery. That hitherto the race has produced, outside the realm of music, none but mute geniuses, is rather due to lack of education than of ability; but "Zingaro" seems to have only been a nickname of the Quentin Matsys of the South, Antonio Solario (1382-1455), and John Bunyan from parish registers does not appear to have had one drop of Gipsy blood.

Outwardly as within Gipsies present strong contrasts, some being strangely hideous, others very beautiful, though not with a regular, conventional beauty. Finely proportioned, they are as a race of middle stature, but lithe and sinewy, insensible to cold or wet, capable of supporting great fatigue. They pride themselves on their small hands and feet; corpulence rarely occurs, and only with the older women. The hair, black or dark brown, inclines to coarseness, is often frizzled, and does not soon turn gray; the complexion, a tawny olive, was compared by the Plymouth Pilgrims (1622) to that of the Indians of North America. The teeth are of dazzling whiteness and perfect regularity, the cheek bones high; and the aquiline nose is overhung by a strongly-marked brow, knit often in

deep lines of thought. But the most striking feature is the full, dark eye, now lusterless, then changing to an expression of mysterious, childlike sorrow, presently blazing forth with sudden passion. As is the case in other Oriental races, the Gipsies early develop and early fade.

GIRAFFE (*Camelopardalis giraffa*), a mammal belonging to the ruminant group of the Artiodactyle Ungulates, and the single living representative of the family *Camelopardalidae*. Intermediate between the members of the deer and ox families, the giraffe differs from both in having neither true horns nor antlers. It possesses, however, two solid, bony, and persistent appendages, attached partly to the frontal and partly to the parietal bones; and not to the former only, as in the true horned ruminants, and these, unlike the processes of the latter, are distinct bones, separable, at least in the young animal, from those of the forehead. These horn-like peduncles are completely covered over by the skin of the forehead, and are terminated by a tuft of bristles, while in front of them there is a protuberance caused by a thickening of the bone, sufficiently prominent in the male to have been frequently described as a third horn. The giraffe is the tallest of existing animals, measuring usually from fifteen to sixteen feet high—the females being somewhat less—but attaining in the largest examples a height of eighteen feet. This exceptional elevation is chiefly due to its great length of neck and limb, the cervical vertebrae, although only seven in number, as in other mammals, being in this case exceedingly long. Its body is proportionately short, measuring only seven feet between the breast and rump, and slants rapidly toward the tail—a peculiarity which has given rise to the erroneous impression that the fore legs of the giraffe are longer than the pair behind. Its feet terminate in a divided hoof, which is as beautifully proportioned as that of the smallest gazelle; and the accessory hoofs found in most ruminants are entirely wanting. Its head is small, its eyes large and lustrous; and these, which give to the giraffe its peculiarly gentle appearance, are capable of a certain degree of lateral projection, which enables the creature, without turning its head, to see around, and, to a certain extent, behind it. The elevated eyes of the giraffe thus enjoy a wider range of vision than those of any other quadruped. Its nostrils are provided with a peculiar mechanism of sphincter muscles, by which they can be opened or closed at will, and the animal is thus enabled to avoid the injurious effects of the sand storms which occasionally pass over its native haunts. Its tongue is remarkable for its great length, measuring about seventeen inches in the dead animal, and for its great elasticity and power of muscular contraction while living. It is covered with numerous large *papilla*, and forms, like the trunk of the elephant, an admirable organ for the examination and prehension of its food. The graceful appearance presented by the giraffe, to which it owes its name through the Arabian *Xirapha*, is greatly heightened by the orange-red color of its hide, mottled as it is all over with darker spots; while in its long tail, ending in a luxuriant tuft of dark-colored hair, it possesses an admirable fly-whipper, without which it would probably be impossible for the giraffe to maintain its ground against the scroot fly, and other stinging insects of Central Africa. It lives on open plains in the neighborhood of low woods, high forest being scrupulously avoided, as depriving it of the extensive prospect which forms its chief defense against the attacks of its two great enemies—the lion and man. It feeds almost exclusively on the foliage of trees, showing a preference for certain varieties of mimosa, and for the young shoots of the prickly acacia, for browsing on which the prehensile tongue and

large free lips of the giraffe are specially adapted. It is gregarious in its habits, living in small herds rarely of more than twenty individuals, although Sir S. Baker, who hunted it in Abyssinia, states that he has seen as many as a hundred thus herding together.

The giraffe is only found wild in Africa, where it ranges throughout the open country of Ethiopia as far south as the confines of Cape Colony. Until about fifty years ago it was almost totally unknown in Europe; it is now, however, to be found in most of the European zoological gardens, where it appears to thrive as well on corn and hay as on the mimosas of its native haunts. It also breeds freely in confinement, so that it may now be regarded as acclimatized in Europe.

The skin of the giraffe forms a valuable leather material, that made from the thicker parts being in special request for sandals; its flesh, according to Sir S. Baker, was, when roasted, the best he had ever tasted; the tendons of its long legs are valued by the Arabs as thread for sewing leather, and as strings for their musical instruments; while its leg bones, which differ from those of other ruminants in being solid, are largely used in England in the manufacture of buttons and other articles of bone.

GIRALDI, GIGLIO GREGORIO, or Lilius Gregorius Gyraldus, one of the scholars and poets of the golden age of Italian literature, was born June 14, 1479, at Ferrara. He died at Ferrara in February, 1552; and his epitaph makes touching and graceful allusion to the sadness of his end. Giralaldi was a man of very extensive erudition; and numerous testimonials to his profundity and accuracy have been given, both by contemporary and by later scholars.

GIRALDI, GIOVANNI BATTISTA, surnamed CYNTHIUS, CINTHIO, or CINTIO, Italian novelist and poet, born at Ferrara in November, 1504, where on December 30, 1573, he died. Besides an epic entitled *Ercole* (1557), in twenty-six cantos, Giraldi wrote nine tragedies, the best known of which *Orbecche*, was produced in 1541. Of the prose works of Giraldi the most important is the *Hecatommithi* or *Ecatomiti*, a collection of tales told somewhat after the manner of Boccaccio, but still more closely resembling the novels of Giraldi's contemporary Bandello, only much inferior in workmanship to the productions of either author in vigor, liveliness, and local color. They have a peculiar interest to students of English literature, as having furnished, whether directly or indirectly, the plots of *Measure for Measure* and *Othello*.

GIRALDUS CAMBRENSIS. See **BARRI**.

GIRARD, PHILIPPE HENRI DE, a celebrated French mechanician, was born at Lourmarin, in the department of Vaucluse, February 1, 1775. In his early life he manifested a strong aptitude for mechanical invention, and he also at that time devoted his attention to botany, painting, and literature. In 1804 he and his brother took out a patent for what is known as the fountain lamp; and at the "Exposition" of 1806 he was awarded a gold medal for his one-cylindred direct acting steam engine. Napoleon having in 1810 decreed a reward of one million francs to whoever should invent a machine for the spinning of flax equally successful with those in use for the spinning of hemp, Girard, after a course of experiments, invented and patented a flax-spinning machine. In 1813 he established a flax mill at Paris and another at Charonne, in both of which he made use of his machine; but although he was declared to have earned the reward offered for the invention the fall of Napoleon in 1815 left the decree unfulfilled. Girard, who expected that the expenses connected with his experiments would be met by the promised premium, now got into serious money difficulties, and had to leave

France for Austria, where, besides establishing a flax mill at Hirtenberg, he built the first line of steamships on the Danube. In 1825, at the invitation of the Emperor Alexander I. of Russia, he went to Poland, where he erected a flax manufactory, round which grew up a village which received the name of Giradow. He was also appointed chief engineer of the mines of Poland. In 1844 he returned to Paris, and exhibited at the Exposition a large number of inventions, including a machine for combing flax, a machine for making gunlocks, several new improvements in guns, a piano piano of double octaves, and a new instrument called the *Tremolophone*. For his inventions connected with the manufacture of flax a gold medal was decreed to him by the jury; and in 1845 the Society of Inventions awarded him a sum which raised the pension he received from the Russian Government to 6,000 francs. Besides the inventions already mentioned, Girard was the author of a large number of others, many of them of considerable importance in connection with various departments of industrial machinery. He died at Paris, August 26, 1845. A pension of 6,000 francs was bestowed in 1857 on his only surviving brother, and another on his niece.

GIRARD, STEPHEN, philanthropist, was born at Bordeaux, France, on May 21, 1750. At the age of thirteen he commenced life as a sailor, and followed his vocation with such assiduity that he was enabled, before the French requisitions of age and service allowed, to become master and captain, in October, 1773. His first mercantile venture was to St. Domingo in February, 1774, whence he proceeded in July to the then colony of New York. After trading for three years between New York, New Orleans, and Port au Prince, he went to Philadelphia in May, 1777, and gave up the sea for a mercantile career. While he was engaged most successfully in the prosecution of an extensive trade, the yellow fever, in its most malignant type, broke out in Philadelphia, sweeping away one-sixth of its population. When, during its height, a hospital was established, for which it seemed almost impossible to secure competent management, Girard devoted himself personally, fearless of all risks, to the care of the sick and the burial of the dead, not only in the hospital, of which he became manager, but throughout the city, supplying the poorer sufferers with money and provisions. Two hundred children, made orphans by the ravages of the fever, were in a great measure thrown upon his care. From this period his success, commercially and financially, was unexampled. He gave a portion of his time to the management of municipal affairs for several years, and rendered efficient service as warden of the port and as director of many public institutions. On the dissolution of the Bank of the United States, he instituted what is known now as the Girard Bank. During the war of 1812 "he rendered valuable services to the Government by placing at its disposal the resources of his bank at a time of difficulty and embarrassment, subscribing to a large loan which the Government had vainly sought to obtain." Girard added to his other avocations that of a practical agriculturist. He died December 26, 1831.

Girard College was founded by him for the education and support of the poor white orphans of his adopted city. His fortune amounted to about seven and a half millions of dollars. After specific legacies of two millions for the erection and endowment of the college, \$140,000 to his relatives, \$300,000 to the State for internal improvements, \$500,000 to the city of Philadelphia to improve its eastern front, \$116,000 to public charities, and various annuities and legacies, he bequeathed the residue of his estate to the city of Phila-

delphia, mainly for the improvement and maintenance of the college. The most minute directions were given by Girard in regard to the buildings to be erected, and the admission and management of the inmates. He specifically requires that the orphans be instructed in the purest principles of morality.

GIRARD, the county seat of Crawford county, Kansas, twenty-six miles southwest of Fort Scott, at the intersection of three railroads, is a thriving town of 2,500 people. It contains seven factories with an invested capital of \$100,000; three schools costing \$40,000; and eight churches. The city is lighted by electricity and owns its own water-works.

GIRARDIN, MADAME EMILE DE, a French authoress, was born at Aix-la-Chapelle, January 26, 1804, and died at Paris June 29, 1855. In 1822 she obtained peculiarly honorable mention from the Academy for a poem on the *Devotion of the Sisters of St. Camille at the Siege of Barcelona*; and not long afterward she published two volumes of miscellaneous pieces, *Essais poétiques* (1824) and *Nouveaux essais poétiques* (1825). To the close of her life she continued to appear both as a novelist and as a writer for the stage, and in both departments she reaped a wide popularity through the wit and emotional force of her productions. *Contes d'une vieille fille à ses neveux* (1832), *La canne de Monsieur de Balzac* (1836), and *Il ne faut pas jouer avec la douleur* (1853) are among the best known of her romances; and her dramatic pieces include *L'École des journalistes* (1840), *Judith* (1843), *Cléopâtre* (1847), *C'est la faute du mari* (1851), *Lady Tartufe* (1853), *La joie fait peur* (1854), *Le chapeau d'un horloger* (1854), and *Une femme qui déteste son mari*, which did not appear till after the author's death. In the literary society of her time Madame Girardin exercised no small personal influence, and among the frequenters of her drawing-room were Gautier and Balzac, Alfred de Musset and Victor Hugo.

GIRARDIN, SAINT-MARC, a politician and man of letters, whose real name was Marc Girardin simply, was born at Paris in 1801, and died at Morsang-sur-Seine on April 11, 1873. In 1828 he began to contribute to the *Journal des Débats*, on the staff of which he remained for nearly half a century. In 1844 he was elected a member of the Academy. During the revolution of February, 1848, Girardin was for a few days a minister, but after the establishment of the republic he was not re-elected deputy, nor did he take any prominent part in politics during the second empire save with his pen. After the war of 1870 he was returned to the Bordeaux assembly by his old department—the Haute Vienne. His Orleanist tendencies, and his objections to the republic, were strong, and though he at first supported Thiers, he afterward became a leader of the opposition to the president. He died, however, before Thiers was actually driven from power.

GIRARDON, FRANÇOIS, a sculptor, whose works are typically characteristic of the epoch of Louis XIV., was born at Troyes in 1628, and died in the Louvre in 1715.

GIRARDVILLE, a Pennsylvania town, situated in the mining regions of Schuylkill county, from which large quantities of anthracite coal are shipped. It has railway, banking and telegraph facilities, and its population (1900) is estimated at about 3,670. The principal business of the place is, in one way or another, dependent on the coal trade.

GIRASOL, a precious stone, exhibiting in strong lights a peculiar and beautiful reflection of bright red or yellow light, which seems to come from the interior of the stone. From this it derives its name (Ital., "sun-turning"). There are different kinds of girasol, variously

referred by mineralogists to quartz and opal, species which, however, are very nearly allied. One kind is also known as *Fire Opal*, which is found only at Zimapan, in Mexico, and in the Faroe Islands. The Mexican specimens are of a rich topaz yellow color, and the reflection is very bright. Another kind is the *Quartz Resinite* of Haiiy, so called because of its characteristic resinous fracture. It is found of various colors, sometimes of a fine yellow or emerald green, more generally bluish-white. For a specimen of extraordinary brilliancy, not an inch and a half in diameter, \$5,000 has been refused. The ancients held this stone in high estimation, and called it *Asteria* (Gr. *aster*, "a star"). They obtained it both from Caramania and from India. The brightest are at present brought from Brazil, but fine specimens are also obtained in Siberia. Imitation girasols are made of glass in which a little oxide of tin is mixed.—The name girasol is sometimes given to a kind of sapphire, also called *Asteria sapphire*, exhibiting a similar reflection of light, and sometimes to *Sunstone*, an aventurine feldspar. According to Castellani, many minerals can be made to reflect light from the interior in the same way as girasol, when they are carefully cut in a spherical or semi-spherical form. He instances adularia, hydrophane (a variety of opal), milky corundum, some kinds of chalcedony, Brazilian chrysolite, etc.

GIRDLE, a band of leather or other material worn round the waist, either to confine the loose and flowing outer robes so as to allow freedom of movement, or to fasten and support the garments of the wearer. In southern Europe and in all Eastern countries the girdle was and still is an important article of dress. Among the Romans it was used to confine the *tunica*; and so general was the custom that the want of a girdle was regarded as strongly presumptive of idle and dissolute propensities. It also formed a part of the dress of the Greek and Roman soldier; the phrase *cingulum deponere*, to lay aside the girdle, was an equivalent to quitting the service. It was used as now in the East to carry money in.

Girdles and girdle-buckles are not found in early Celtic interments, nor are they frequent in Gallo-Roman graves. But in Frankish or Burgundian graves they are almost constantly present, often ornamented with plaques of bronze or silver, and the clasps or mountings chased or inlaid with various ornamental designs, occasionally including figures of the cross, and rude representations of Scripture subjects. In later times girdles are frequently represented on brasses and monumental effigies from the twelfth to the sixteenth century. They were either of leather or of woven materials, often of silk and adorned with gold and gems. Among the sumptuary regulations of Edward III. of England there were prohibitions against wearing girdles of gold and silver, unless the wearer was of knightly rank or worth £200 a year. Similar regulations against extravagance in girdles are occasionally found to the sixteenth century. The brasses of the fifteenth century present many beautiful examples of ladies' girdles which were often worn like that of the knight with the ornamental end hanging down in front, sometimes with both ends depending from a large clasp or ornamental fastening in the center. Allusions to the girdle are common in the poetry of the sixteenth and seventeenth centuries. The purse, the dagger, the rosary, the pen and inkhorn, and the bunch of keys were carried suspended from it, and hence it was an ancient custom for bankrupts or insolvent persons to put off and surrender their girdles in open court. It is recorded that the widow of Philip I., duke of Burgundy, renounced her right of succession by putting off her girdle upon the duke's tomb. The girdle, which was a very important ele-

ment in the dress of the Levitical priesthood, does not appear as an ecclesiastical vestment in the Christian church until the eighth century. Germanus, who died in 740, mentions the girdle worn by deacons; and Hrabanus Maurus in the succeeding century speaks of the girdle as one of the regular vestments, and refers to its symbolism. Some centuries later the church had to discountenance extravagance in this article of attire, and splendor in the decoration of girdles was denounced as secular and unbefitting the ecclesiastical character.

GIRDLE OF VENUS (*Cestum veneris*), one of the *Acaphoræ*, inhabiting the Mediterranean, gelatinous, of a ribbon-like shape, sometimes five or six feet long by about two inches wide; although considered with reference to the structure of the animal, the apparent length is really its breadth, and the apparent breadth its length. The mouth is situated in the middle of the inferior edge, and the stomach is imbedded in the gelatinous substances. The edges are fringed with cilia, by the movements of which the creature seems to be propelled in the water. It exhibits iridescent colors by day, and phosphorescence by night. Its substance is so delicate that a perfect specimen can with difficulty be obtained.

GIRGEH, **GIRGA**, or **JIRJEH**, a town of Upper Egypt, situated on the left bank of the Nile, about nine miles northwest of the ancient city of Abydos. It owes its name to the Coptic monastery of St. George or Girgis, and is the seat of a Coptic bishop, possesses eight mosques and a Roman Catholic monastery which ranks as the oldest in Egypt, and numbers from 8,000 to 10,000 inhabitants, of whom about 500 are Christians.

GIRGENTI, a city in the south of Sicily, at the head of a province of its own name, occupies a fine position about three miles from the coast on a platform of Mount Camicus, more than 1,100 feet above the level of the sea. It lies about sixty miles south-southeast of Palermo, with which it is connected by a railway ninety miles long. As seen from the lower ground Girgenti presents a grandiose but somber appearance, with its buildings rising in close array from ancient substractions and the steep rocks of the mountain; but within it is for the most part mean, monotonous, and melancholy, the streets with few exceptions being confined, irregular, steep, and ill-paved, and the houses all presenting the same gray-brown walls, the same reddish roofs, and same narrow doors and narrow windows. In the history of Girgenti there is little of note; the historical interest of the district gathers round the splendid ruins of the older Agriguntum, which lies between Girgenti and the sea.

GIRODET DE ROUSSY, ANNE LOUIS, better known as Girodet-Trioson, was born at Montargis, January 5, 1767. After some preliminary studies under a painter named Luquin, Girodet entered the school of David, and at the age of twenty-two he successfully competed for the Prix de Rome. He was regarded as the first of the Romantic school, and from 1799 to 1810 he was the most popular—perhaps deservedly so—painter of the Romanticists. His productions during this period have been the subject of many contending criticisms. His powers after 1818 began to fail, and his habit of working at night and other excesses told upon his constitution; in the Salon of 1812 he exhibited only a *Tête de Vierge*; in 1819 *Pygmalion et Galaté* showed a still further decline of strength; and in 1824—the year in which he produced his portraits of Cathelineau and Bonchamps—Girodet died on December 9, aged fifty-eight.

GIRONDE, a maritime department in the southwest of France, formed from four divisions of the old province of Guyenne, viz., Bordelais, Bazadais, and parts of Périgord and Agénois. It is bounded on the north

by the department of Charente-Inférieure, east by those of Dordogne and Lot-et-Garonne, south by that of Landes, and west by the Bay of Biscay. It takes its name from the river or estuary of the Gironde formed by the union of the Gironna and Dordogne. The department divides itself naturally into a western and an eastern portion. The former, which is termed *Les Landes*, occupies more than a third of the department, and consists chiefly of morasses, or of sandy and unfruitful downs. The downs stretching along the sea-coast have, however, been now planted with pines, which, binding the sand together by means of their roots, afford an efficacious protection against the encroachments of the sea. Near the coast are two extensive lakes, Carcans and Lacanau, communicating with each other, and with the Bay of Arcachon, near the southern extremity of the department. The Bay of Arcachon contains numerous islands, and on the land side forms a vast shallow lagoon, a considerable portion of which, however, has been drained and converted into arable land. The eastern portion of the department consists chiefly of a succession of hill and dale, and, especially in the valley of the Gironde, is very fruitful. The chief town is Bordeaux. The total area is 3,761 square miles; and the population in 1866 was 701,855, and in 1901, 820,781.

GIRONDISTS (Fr. *Girondins*), the name given during the French revolution to the moderate Republican party. When the Legislative Assembly met in October, 1791, the Gironde department chose for its representatives Vergniaud, Guadet, Gensonné, Grangeneuve, and Ducos, all of whom soon acquired great influence by their rhetorical talents and political principles. They were joined by Brissot's party and the adherents of Roland, as well as by several leaders of the Center, such as Condorcet, Fauchet, Lasource, Isnard, and Henri La Rivière, and for some time had a Parliamentary majority. From this nucleus grew the so-called Girondist party, which for a time exerted a powerful influence in the Revolution, but which came to an unfortunate end, nearly all the leaders being guillotined. The advance of the Austrian and Prussian invaders threw the influence into the hands of the Jacobins, who alone possessed vigor enough to "save the revolution." The great *emeute* of the 10th of August finally assured their triumph, which vented itself in such infamies as the September massacres. Next followed the National Convention and the trial of the king. The Girondists tried to save the king's life by appealing to the sovereign people. The fall of Roland and the ascendancy of Robespierre followed. Dumouriez, to save his head, rode over into the Austrian camp, and the famous Committee of Public Safety was created. Of its members not one was a Girondist. The last effort of the party was an ineffectual attempt to impeach Marat, who, however, on the 2d of July overthrew the party, arresting as many as thirty-one deputies. The majority had already escaped to the provinces. In the departments of Eure, Calvados, all through Brittany, and at Bordeaux and elsewhere in the southwest the people rose in their defense, but the movement was soon crushed by the irresistible energy of the Mountain, now triumphant in the Convention.

On October 1, 1793, the prisoners were accused before the Convention of conspiring against the republic with Louis XVI., the royalists, the Duke of Orleans, Lafayette, and Pitt, and it was decreed that they should be brought before the Revolutionary Tribunal. On the 24th their trial commenced. The accusers were such men as Chabot, Hébert, and Fabre d'Eglantine. The Girondists defended themselves so ably that the Convention on the 30th was obliged to decree the closing of the

investigation. That very night, Brissot, Vergniaud, Gensonné, Ducos, Fonfrède, Lacaze, Lasource, Valazé, Sillery, Fauchet, Duperret, Carra, Lehardy, Duchatel, Gardien, Boileau, Beauvais, Vigée, Duprat, Mainville, and Antiboil were sentenced to death, and, with the exception of Valazé, who stabbed himself on hearing his sentence pronounced, all perished by the guillotine. On their way to the Place de Grève, in the true spirit of French republicanism, they sang the *Marseillaise*. Coustard, Manuel, Cussy, Noel, Kersaint, Rabout St. Etienne, Bernard, and Mazuyer went later to the same fate. Biroteau, Grangeneuve, Guadet, Salles, and Barbaroux ascended the scaffold at Bordeaux; Lidon and Chambon at Brives; Valady at Périgueux; Dechézeau at Rochelle. Rebecqui drowned himself at Marseilles, Fétion and Buzot stabbed themselves, and Condorcet poisoned himself. Sixteen months later, after the fall of the Terrorists, the outlawed members, including the Girondists Lanjuinais, Defemon, Pontécoulant, Louvet, Isnard, and La Rivière, again appeared in the Convention. See Lamartine's *Histoire des Girondins* (8 vols. Paris, 1847); and Guadet's *Les Girondins* (new ed. 1889).

GIRTIN, THOMAS, one of the greatest of the earlier English landscape-painters in water-colors, was born in London, February 18, 1775, and died November 9, 1802. He was a close friend and fellow-student of Turner; and to them many improvements in water-color painting are due. Girtin struck out a bolder style than had been attempted, attained great richness of color and breadth, but was somewhat careless of detail, and sometimes inaccurate in drawing. His best works are panoramic views of London and of Paris.

GIRTON COLLEGE, the most notable college for women in England, was instituted at Hitchin in 1869, but removed to Girton, near Cambridge, in 1873. Instruction is given in divinity, modern languages, classics, mathematics, moral science, natural science (including physiology and chemistry), history, vocal music. There are about thirty lecturers, mostly connected with Cambridge University. The mistress and five resident lecturers are ladies. The students, who number about 125, are admitted after an entrance examination; the ordinary course extends over three years, half of each year being spent in college. "Degree Certificates" are granted to those who satisfy their examiners as to their proficiency according to the standard of the examinations for the B. A. of Cambridge University; \$175 per term covers all college charges.

GIRVAN, a burgh of barony and market-town, in the county of Ayr, Scotland, is situated at the mouth of the river Girvan, twenty-one miles southwest of Ayr, and nearly opposite Ailsa Craig, a rocky island ten miles distant.

GISBORNE, a post-town of New Zealand, in the North Island, is situated on the river Turanganui (fine bridge, 1885), 250 miles southeast of Auckland, with which city it has steamer communication. It is the port of entry for Poverty Bay, a name given by Captain Cook in 1769, and sometimes still retained for the town; only small vessels can come up to the wharves, but in 1889 a harbor, to cost \$1,000,000, was in course of construction. In 1886 petroleum was struck in the neighborhood. Population (1901), about 5,000.

GISORS, a town of France, department of Eure, is situated in a pleasant valley on the Epte, forty-five miles east-northeast of Paris.

GITSCHIN, the chief town of a circle in Bohemia, is situated on the Cydlina and on the North-West Austrian railway, fifty miles northeast of Prague. Gitschin was made the capital of the duchy of Friedland by Wallenstein in 1627, at which time it contained only 200 houses.

Wallenstein was interred at the neighboring Carthusian monastery, but in 1639 the head and right hand were taken by General Banér to Sweden, and in 1702 the other remains were removed by Count Vincent of Waldstein to his hereditary burying ground at Münchengrätz. At Gitschin the Prussians gained a great victory over the Austrians, June 29, 1866. Population, 7,000.

GIULIO ROMANO. See PIRPI.

GIUNTA PISANO, the earliest Italian painter whose name is found inscribed on an extant work, exercised his art from 1202 to 1236; he may perhaps have been born toward 1180 in Pisa, and died in or soon after 1236.

GIURGEVO, in Roumanian *Giurgiu* or *Shursha*, a town of Roumania (formerly of Lower Wallachia) at the head of the district of Vlashka, lies on the left or northern bank of the Danube, over against Rustchuk, in Bulgaria, and is distant about forty miles from Bucharest, with which it has been connected by railway since 1860. The population in 1900 was about 20,000.

GIUSTI, GIUSEPPE, Tuscan satirical poet, was born at Monsummano, a small village of the Valdinievole, on May 12, 1809. In 1826 he went to study law at Pisa; but, disliking the study, he spent eight years in the course, instead of the customary four. In 1834 Giusti, having at last entered the legal profession, left Pisa to go to Florence, nominally to practice with the advocate Capoquadri, but really to enjoy life in the capital of Tuscany. He fell seriously in love a second time, and as before was abandoned by his love. It was then he wrote his finest verses, by means of which, although his poetry was not yet collected in a volume, but for some years passed from hand to hand, his name gradually became famous. The greater part of his poems were published clandestinely at Lugano, at no little risk, as the work was destined to undermine the Austrian rule in Italy. After the publication of a volume of verses at Bastia, Giusti thoroughly established his fame by his *Gingillino*, the best in moral tone as well as the most vigorous, and effective of his poems. Giusti entered heart and soul into the political movements of 1847 and 1848. He fell afterward from the high position he had held in public estimation, and in 1848 was regarded as a reactionary. His friendship for the Marquis Gino Capponi, who had taken him into his house during the last years of his life, and who published after Giusti's death a volume of illustrated proverbs, was enough to compromise him in the eyes of such men as Guerrazzi, Montanelli, and Niccolini. On May 31, 1850, he died at Florence in the palace of his friend.

GIUSTINIANI, the name of a prominent Italian family which originally belonged to Venice, but established itself subsequently in Genoa also, and at various times had representatives in Naples, Corsica, and several of the islands of the Archipelago.

In the Venetian line the following are most worthy of mention: 1. LORENZO (1380-1465), the Laurentius Justinianus of the Roman calendar, at an early age entered the congregation of the canons of Saint George in Alga, and in 1433 became general of that order. He died in January 8, 1465. (2) LEONARDO (1388-1446), brother of the preceding, was for some years a senator of Venice, and in 1443 was chosen procurator of St. Mark. He translated into Italian Plutarch's *Cinna* and *Lucullus*, and was the author of some poetical pieces, amatory and religious, as well as of rhetorical prose compositions. (3) BERNARDO (1408-1489), son of Leonardo, was a pupil of Guarino and of George of Trebizond, and entered the Venetian senate at an early age. He served on several important diplomatic missions both to France and Rome, and, about 1485, became one of the council of ten. His orations and letters were published in 1492; but his title to any measure of

fame he possesses rests upon his history of Venice, *De Origine Urbis Venetiarum rebusque ab ipsa gestis historia*. (4) PIETRO, also a senator, lived in the sixteenth century, and wrote a *Historiarum Venetarum* in continuation of that of Bernardo. He was also the author of chronicles *De Gestis Petri Mocenigi* and *De Bello Venetorum cum Carolo VIII*. The latter has been reprinted in the *Script. Rer. Ital.*, vol. xxi.

Of the Genoese branch of the family, the most prominent members were the following: (1) PAOLA DI MONIGLIA (1444-1502), a member of the order of Dominicans, was, from a comparatively early age, prior of their convent at Genoa. As a preacher he was very successful, and his talents were fully recognized by successive popes, by whom he was made master of the sacred palace, inquisitor-general for all the Genoese dominions, and ultimately bishop of Scio and Hungarian legate. He was the author of a number of Biblical commentaries (no longer extant), which are said to have been characterized by great erudition. (2) AGOSTINO (1470-1536), was born at Genoa, and spent some wild years in Valencia, Spain. Having in 1487 joined the Dominican order, he gave himself with great energy to the study of Greek, Hebrew, Chaldean and Arabic, and in 1514 commenced the preparation of a polygot edition of the Bible. As bishop of Nebbio in Corsica, he took part in some of the earlier sittings of the Lateran council (1516-17), but in consequence of party complications, withdrew to his diocese, and ultimately to France, where he became a pensioner of Francis I., and was the first to occupy a chair of Hebrew and Arabic in the university of Paris. After an absence from Corsica for a period of five years, during which he visited England and the Low Countries, and became acquainted with Erasmus and More, he returned to Nebbio about 1522, and there remained, with comparatively little intermission, till in 1536, when, while returning from a visit to Genoa, he perished in a storm at sea.

The name Giustiniani has also been borne by the following:—(1) POMPEIO (1569-1616), a native of Corsica, who served under Alessandro Farnese and the marquis of Spinola in the Low Countries, where he lost an arm, and, from the artificial substitute which he wore, came to be known by the sobriquet *Bras de Fer*. He also defended Crete against the Turks; and subsequently was killed in a reconnaissance at Friuli. (2) GIOVANNI (1513-1556), born in Candia, translator of Terence's *Andria* and *Eunuchus*, of Cicero's *In Verrem*, and of Virgil's *Æneid*, l. viii. (3) ORSATTO (1538-1603), Venetian senator, translator of the *Edipus Tyrannus* of Sophocles, and author of a collection of *Rime*, in imitation of Petrarch. He is regarded as one of the latest representatives of the classic Italian school. (4) GERONIMO, a Genoese, flourished during the latter half of the sixteenth century. He translated the *Alcestis* of Euripides and three of the plays of Sophocles; and wrote two original tragedies, *Jephthé* and *Christo in Passione*. (5) VINCENZO, who in the beginning of the seventeenth century built the Roman palace and made the art collection which are still associated with his name (see *Galleria Giustiniana*, Rome 1631). The collection was removed in 1807 to Paris, where it was to some extent broken up. In 1815, all that remained of it, about 170 pictures, was purchased by the king of Prussia and removed to Berlin, where it forms a portion of the royal museum.

GIVET, one of the strongest fortified towns of France, on the Belgian frontier, situated in the department of Ardennes, on the river Meuse, forty miles north-northeast of Mézières. The Eastern French railway connects it with Rhéims, and the Belgian railways connect it with Namur and Charleroi. Pop., 8,000.

GIVORS, a town of France, department of Rhône, is situated on the Rhone and the canal of Rive-de-Gier, near the railway between Lyons and St. Etienne, fourteen miles south of Lyons. Population, 10,856.

GLACIAL PERIOD, or **ICE AGE**, is a term used in geology to designate that period the records of which are included in the Pleistocene System. "Glacial period" and "Pleistocene period" are in fact synonymous as regards all northern and temperate regions—the former term being used when the prominent climatic characteristics of the period are thought of, while the latter is employed with reference to its life. A short account may be given of the relics which furnish evidence of former glacial conditions having obtained in many regions that are now in the enjoyment of temperate climates. It is chiefly in the northern parts of Europe and North America, and the hilly and mountainous districts of more southern latitudes, that the glacial deposits, properly so called, are developed. These deposits consist partly of morainic materials, erratics, etc., and partly of marine, fresh-water and terrestrial accumulations. The most important member of the series is *Boulder-clay* or, as it is often termed, *till*. This is an unstratified clay, full of ice-worn stones and boulders, which is believed to have been formed and accumulated under glacier-ice. Several distinct and separate sheets of boulder-clay have been recognized, divided from each other by intercalated "interglacial beds," which last are often fossiliferous. The lowest and oldest boulder-clay covers vast areas in the British Islands and northern Europe—extending south as far as the Bristol Channel and the valley of the Thames in England, and to the foot of the Harz Mountains, etc., in middle Germany. Boulder-clay of the same age spreads over the low grounds of Switzerland, and extends from the great Alpine valleys for many miles into the circumjacent low-lying regions. Similar ground-moraines have been met with in all the mountainous and hilly tracts of Europe, as in central France, the Pyrenees, the Spanish Sierras, the mountains of Corsica, the Apennines, the Vosges, the Black Forest, the Erzgebirge and other ranges of Germany, the Carpathians, etc. The rock-surfaces on which the boulder-clay rests are often smoothed and striated, or much crushed and broken, while the hills and mountain-slopes in regions where boulder-clay occurs give evidence of having been abraded and smoothed by glacial action. At the time the boulder-clay was formed, Scotland, Ireland, the major portion of England, Scandinavia, Denmark, Holland, the larger half of Belgium, Germany as far south as Leipzig, and vast regions in Poland and Russia were covered with a great *mer de glace*. Contemporaneously with this ice-sheet all the mountain-regions of the central and southern regions of the Continent nourished extensive snowfields and glaciers, which last flowed out upon the low ground often for very great distances. Thus, Lyons stands upon old moraines which have been carried down from the mountains of Dauphiné and Savoy. The interglacial deposits point to great changes of climate when the snowfields and glaciers melted away, and temperate conditions of climate supervened, as is shown by the geographical distribution of these deposits, and by the character of the plant and animal remains which they have yielded. The youngest boulder-clay, overlying, as it does, such interglacial beds, proves that the glacial period closed with another advance and final retreat of the Scandinavian ice-sheet and the great glaciers of the Alps, etc. The terminal moraines of the last ice-sheet do not come so far south as those of the first and greatest *mer de glace*. These moraines show that the ice covered the Scandinavian peninsula, filled up the Baltic,

invaded north Germany, and overflowed Finland and wide regions in the north of Russia. Similarly in the Alps, etc., the last great extension of the glaciers was not equal to that of the first.

The boulder-clays are not the only evidence of glacial conditions. Besides those accommodations and the scratched and crushed rock-surfaces already referred to, we encounter numerous erratics, **GIANTS KETTLES** (*g.v.*), clays with Arctic marine shells and erratics (in Scotland, Prussia, etc.)—the organic remains associated with the glacial deposits often affording strong evidence of cold conditions. The following table shows the general succession of the glacial deposits in several parts of Europe:

SCOTLAND—

6. Valley-moraines and fluvio-glacial gravels = small local glaciers.
5. Kames, erratics, fluvio-glacial deposits, laid down during retreat of last general ice-covering.
4. Clays, etc., with Arctic marine shells, occurring up to a height of 100 feet = deposits belonging to the period of retreat of *mer de glace*, and contemporaneous to a large extent with those of 5.
3. Upper boulder-clay = *moraine profonde* of latest *mer de glace*.
2. Interglacial beds = disappearance of cold conditions; clothing and peopling of the land-surface with temperate fauna and flora; subsequent submergence to not less than 500 or 600 feet below present level.
1. Lower boulder-clay with intercalated interglacial fossiliferous beds = the product of more than one *mer de glace*. The lowest clay marks the period of greatest glaciation.

ENGLAND AND IRELAND—

6. Valley-moraines and fluvio-glacial gravels.
- 5 and 4. Kames or eskers, erratics; fluvio-glacial deposits.
3. Upper boulder-clay of last *mer de glace*.
2. Interglacial beds, marine and fresh-water. Disappearance of glacial conditions; land-surface at first; subsequent submergence to considerable extent.
1. Lower boulder-clays with intercalated aqueous deposits, indicating probably same conditions as 1 in Scottish series.

NORTHERN EUROPE—

4. Sand and gravel; erratics; shelly marine clays (in Baltic area).
3. Upper boulder-clay and terminal moraines of last *mer de glace*.
2. Interglacial beds, partly fresh-water and terrestrial, partly marine.
1. Lower boulder-clay = greatest extension of ice.

SWITZERLAND—

4. Fluvio-glacial gravels in terraces.
3. Moraines and upper boulder-clay of last great glaciers.
2. Interglacial beds, with mammalian remains, etc.
1. Lower boulder-clay.

CENTRAL FRANCE—

4. Fluvio-glacial gravels.
3. Moraines.
2. Interglacial beds, richly fossiliferous.
1. Ground-moraines (Mont Dore).

In North America glacial deposits are developed upon a great scale, and there, as in Europe, the boulder-clays are separated by interglacial deposits. The northern part of the continent was drowned in ice during the greatest extension of the *mer de glace*, the ice flowing south into New Jersey, whence its front extended north-west through Pennsylvania, after which it trended south-west through Ohio and Indiana to reach the thirty-eighth parallel of latitude in Illinois. It then appears to have swept away to the northwest in the direction of the Missouri valley. The latest American *mer de glace* did not come so far south—its terminal moraines being well developed in Minnesota, Wisconsin, Michigan, etc. Evidence of former excessive glacial conditions has been met with in many other parts of the world—old moraines, etc., having been detected in the Caucasus, the mountains of Asia Minor, the Lebanon, the Himalayas, etc., in Asia; in the Atlas, the Kagu and Kreme Mountains, etc., in Africa; in the Andes, Tierra del Fuego, etc., in South America; in New Zealand, etc.

GLACIER, a name given to a mass of ice, having its origin in the hollows of mountains, where perpetual snow accumulates, but which makes its way down toward the lower valleys, where it gradually melts, until it terminates exactly where the melting, due to the contact of the warmer air, earth, and rain of the valley, compensates for the bodily descent of the ice from the snow reservoirs of the higher mountains.

The diminution of temperature as we ascend the slopes of mountains, is indicated by successive zones of vegetation, and finally by the occurrence of perpetual snow. It was first shown by Baron Humboldt and Von Buch that the limit of perpetual snow depends principally on the temperature of the summer, and not upon that of the whole year.

A glacier usually protrudes into a valley far below the limits of perpetual snow, and terminates amidst a wilderness of stones borne down upon its surface and deposited by its fusion. This earthy and rocky rubbish is termed moraine matter. Lying in front of the lower end of a glacier, it marks in a characteristic and certain manner the greatest limit of extension which the glacier has at any one time attained. Sometimes a glacier is seen to have withdrawn very far within its old limits, leaving a prodigious barren waste of stones in advance of it, which, being devoid of soil, nourishes not one blade of grass. At other times the glacier pushes forward its margin beyond the limit which it has ever reached (at least within the memory of man), tears up the ground with its icy plowshare, and shoves forward the yielding turf in wrinkled folds, uprooting trees, moving vast rocks, and scattering the walls of dwelling-houses in fragments before its irresistible onward march.

The lower end of a glacier is usually steep,—sometimes with a dome-shaped unbroken outline, more frequently broken up by intersecting cracks into prismatic masses which the continued action of the sun and rain sharpen into pyramids, often assuming (as in the glacier of Bossons at Chamouni) grotesque or beautiful forms. From a vault in the green-blue ice, more or less perfectly formed each summer, the torrent issues which represents the natural drainage of the valley, derived partly from land springs, partly from the fusion of the ice. The united or crevassed condition of the glacier generally depends almost entirely on the slope of its bed. If it incline rapidly, numerous transverse fissures are formed from the imperfect yielding of the ice during its forced descent along its uneven channel. These cracks often extend for hundreds of yards, and may be hundreds of feet in depth; but their greatest depth is not accurately known, since they are rarely quite vertical. In many cases, however, the crevasses are comparatively few in number, and the glacier may be readily traversed in all directions. This is especially the case if a glacier of considerable dimensions meets with any contraction in its course. The ice is embayed and compressed, and its slope lessens, just as in the case of a river when it nears a similar contraction preceding a fall. Such level and generally traversable spaces may be found about the middle regions of the Mer de Glace, the lower glacier of Grindelwald, the lower glacier of the Aar, and in many other cases. The last-named glacier is perhaps the most remarkable even and accessible of any in Switzerland. The slope of its surface is in many places only 3° . The Pasterzen glacier in Carinthia is even less inclined. It is in such portions of a glacier that we commonly find internal cascades, or "moulins." These arise from the surface water being collected into a considerable mass by a long course over its unbroken surface, and then precipitated with violence into the first fissure it meets with. The descending cascade keeps open its channel,

which finally loses the form of a fissure, presenting that of an open shaft, often of immense depth.

Nearly connected in their origin with the internal cascades are the "gravel cones," occasionally seen on the surface of glaciers, which appear to be formed in this way. A considerable amount of earthy matter derived by the superficial water-runs from the moraine accumulates in heaps in the inequalities of the ice, or at the bottom of the "moulins." As the glacier surface wastes by the action of the sun and rain, these heaps are brought to the surface, or rather the general surface is depressed to their level. If the earthy mass be considerable, the ice beneath is protected from the radiation of the sun and from the violent washing of the rain; it at length protrudes above the general level of the glacier, and finally forms a cone which appears to be entirely composed of gravel, but is in fact ice at the heart, with merely a protecting cover of earthy matter. These singular cones are very well seen on the glacier of the Aar, but on most others they are comparatively rare. The similar protective action of large stones detached from the moraines and lying on the surface of the ice often produces the striking phenomenon of "glacier tables." Stones of any considerable size almost invariably stand upon a slightly elevated pillar of ice; but when they are broad and flat they occasionally attain a height of six and even of twelve feet above the general level.

The superficial waste of a glacier is thus a very important phenomenon. Owing to it the body of the ice has its vertical thickness rapidly diminishing during the heats of summer, and, as we have already intimated, the lower end of a glacier has its position determined by the amount of this waste. Suppose a glacier to move along its bed at the rate of three hundred feet per annum, and imagine (merely for the sake of illustration) its yearly superficial waste to be twenty feet; then the thickness of the glacier will diminish by twenty feet for every three hundred feet of its length, or at the rate of three hundred and sixty feet per mile, so that the longitudinal section of a glacier has the form of a wedge; and however enormous its original thickness, after a certain course we must at length come to the thin end of the wedge; and that the more rapidly as the causes of melting increase toward the lower extremity. These causes are indeed so various that it is difficult to estimate them with accuracy. We have (1) the direct solar heat (2) the contact of warm air, and (3) the washing of rain. All these causes act on the surface and produce the "ablation" of the surface. Besides these, the ice of the glacier wastes somewhat beneath by the contact of the soil and the washing of the inferior streams. This may be called its "subsidence." Further, the natural slope of the rocky bed of the glacier causes any point of the surface to stand absolutely lower each day in consequence of the progressive motion. These three causes united produce the "geometrical depression" of the surface. Principal J. D. Forbes showed how the several effects may usually be distinguished by observation. During the height of summer, near the Montanvert, he found the daily average ablation to be 3.62 inches, the daily subsidence to be 1.63 inches. Seven-tenths of the geometrical depression are due, therefore, to the former cause, and three-tenths to the latter. This is a very large amount, and it is certain that during the colder period of the year, and while the glacier is covered with snow, the subsidence is not only suspended, but the glacier recruits in thickness a portion of its waste during the seasons of summer and autumn. To this subject we shall again return.

The middle region of the great glaciers of the Alps extends from the level of about 6,000 to 8,000 feet

above the sea. The inclination is usually there most moderate—say from $2\frac{1}{2}^{\circ}$ to 6° . But this is not invariably the case. Beyond 8,000 feet we reach the snow-line. The snow-line is a fact as definite on the surface of a glacier as on that of a mountain, only in the former case it occurs at a somewhat lower level. It cannot be too distinctly understood that the fresh snow annually disappears from the glacier proper. Where it ceases entirely to melt, it of course becomes incorporated with the glacier. We have therefore arrived at the region where the glacier *forms*; everywhere below it only *wastes*. This snowy region of the glacier is called in French *névé*, in German *firn*. As we ascend the glacier it passes gradually from the state of ice to the state of snow. The superficial layers are more snowy and white, in fact nearly pure snow; the deeper ones have more color and consistency, and break on the large scale into vast fragments, which at Chamouni are called *seracs*. The *névé* moves, as the glacier proper does, and it is fissured by the inequalities of the ground over which it passes. These fissures are less regular than those of the lower glacier. They are often much wider, in fact of stupendous dimensions, and, being often covered with treacherous snowy roofs, constitute one of the chief dangers of glacier traveling. The constitution of the *névé* may be well studied on the Glacier du Géant, a tributary of the Mer de Glace. The mountain-clefts in which large glaciers lie usually expand in their higher portions (in conformity with the ordinary structure of valleys) into extensive basins in which snow is perpetual, and which therefore contain the *névé*, the true origin and material of the glacier, which is literally the overflow of these snowy reservoirs. The amount of overflow or the discharge of the glacier—upon which depends the extent of its prolongation into the lower valleys—depends in its turn on the extent of the *névé* or collecting reservoir. Glaciers with small reservoirs of necessity perish soon.

The ice of the glacier proper has a very peculiar structure, quite distinct from the stratification of the snow on the *névé* (the relics of its mode of deposit), and one which requires special notice. When we examine the appearance of the ice in the wall of an ordinary crevasse (especially if it be tolerably near the side of the glacier) we are struck with the beautiful vertically laminated structure (first observed by Principal Forbes) which it commonly presents, resembling delicately veined marble in shades varying from bluish-green, through green, to white. When we trace the direction of the planes constituting the laminated structure, by observing them on the surface of the glacier (where they are usually well seen after rain, or in the channels of superficial water-runs), we find that where best developed (or not very far from the sides of the glacier) these laminae are nearly parallel to the sides, but rather incline from the shore to the center of the ice stream as we follow the declivity of the glacier.

There is something about a glacier which almost inevitably conveys to the mind the idea of a stream. This may be traced in the description of unscientific tourists, of poets, and of some of those who have addressed themselves more seriously to the question of the real nature of these bodies.

The most characteristic and remarkable feature of glaciers is their motion downward from the *névé* toward the lower valley. The explanation of it is by far the most important application of mechanical physics connected with the subject. The principal theories to account for the progressive motion of glaciers which were prevalent previous to 1842, may be briefly characterized as De Saussure's and De Charpentier's,

though each had been maintained long before by the earlier Swiss writers. The first may be called the *gravitation* theory; the latter the *dilatation* theory. Both suppose that the motion of the ice takes place by its sliding bodily over its rocky bed, but they differ as to the force which urges it over the obstacles opposed by friction and the irregularities of the surface on which it moves.

The following quotation from De Saussure explains his views with his usual precision: "These frozen masses, carried along by the slope of the bed on which they rest, disengaged by the water (arising from their fusion owing to the natural heat of the earth) from the adhesion which they might otherwise contract to the bottom—sometimes even elevated by the water—must gradually slide and descend along the declivity of the valleys or mountain slopes which they cover. It is this slow but continual sliding of the icy masses on their inclined bases which carries them down into the lower valleys, and which replenishes continually the stock of ice in valleys warm enough to produce large trees and rich harvests." Very sufficient objections have been urged against this theory. It is evident that De Saussure considered a glacier as an accumulation of icy fragments, instead of a great and continuous mass, throughout which the fissures and "crevasses" bear a small proportion to the solid portion; and that he has attributed to the subglacial water a kind and amount of action for which there exists no sufficient or even probable evidence. The main objection, however, is this, that a sliding motion of the kind supposed, if it commence, must be accelerated by gravity, and the glacier must slide from its bed in an avalanche. The small slope of most glacier valleys, and the extreme irregularity of their bounding walls, are also great objections to this hypothesis.

The dilatation theory ingeniously meets the difficulty of the want of a sufficient moving power to drag or shove a glacier over its bed, by calling in the well-known force with which water expands on its conversion into ice. The glacier being traversed by innumerable capillary fissures, and being in summer saturated with water, in all its parts, it was natural to invoke the freezing action of the night to convert this water into ice, and by the amount of its expansion to urge the glacier onward in the direction of its greatest slope. In answer to this, it is sufficient to observe, in the first place, that during the height of summer the portions of those glaciers which move fastest are never reduced below the freezing point, and that, even in the most favorable cases of nocturnal radiation producing congelation at the surface, it cannot (by well-known laws of conduction) penetrate above a few inches into the interior of the glacier. Again, the ascertained laws of glacier-motion are (as will be immediately seen) entirely adverse to this theory, as it is always accelerated by hot weather and retarded by cold, yet does not cease even in the depths of winter.

It is singular how slow observers were to perceive the importance to the solution of the problem of glacier-motion of ascertaining with geometrical precision the amount of motion of the ice, not only from year to year, but from day to day, in summer and winter, whether constant or variable at the same point, whether continuous or by starts: if variable, on what circumstances it depended, and in what manner it was affected at different points of the length and breadth of a glacier.

This method of studying the question was taken up by Forbes. His observations were commenced on the Mer de Glace of Chamouni, in June 1842. Between the 26th and 27th of that month the motion of the ice opposite a point called the "Angle" was found, by means of a theodolite, to be 16.5 inches in twenty-six

hours; between the 27th and 28th, 17.4 inches in twenty-five and a half hours; and from 6 A.M. to 6 P.M. on the 28th the motion was 9.5 inches, or 17.5 inches in twenty-four hours; whilst the proportional motion during even an hour and a half was observed. No doubt could therefore remain that the motion of the ice is continuous and tolerably uniform—in short, that it does not move by jerks. He also ascertained about the same time that the motion of the ice is greatest toward the center of a glacier and slower at the sides, contrary to an opinion then maintained on high authority. He next found that the rate of motion varied at different points of the length of the same glacier, being on the whole greatest where the inclination of its surface is greatest. As the season advanced, he observed notable changes in the rate of motion of the same part of the ice, and connected it by a very striking direct relation with the temperature of the air. These facts were established during the summer of 1842, and promptly published. By means of occasional observations during the following winter and spring by his guide, Auguste Balmat of Chamouni, and by a more full comparison of the entire motion of a glacier for twelve months with its motion during the hot season of the year, another generally received error was rectified: the motion of the glacier continues even in winter, and has a very perceptible ratio to the summer motion. Last of all, it was found that the surface of a glacier moves faster than the ice nearer the bottom or bed.

These and some minor laws of motion, being undoubted expressions of the way in which glaciers move, were formulated by Forbes in an approximate theory: "A glacier is an imperfect fluid or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts."

Any mechanical theory of glaciers must be more or less imperfect which does not explain the remarkable veined or ribboned structure of the ice, with its peculiar course through the interior of the glacier, as above described. According to Forbes the fundamental idea is that the veined or ribboned structure of the ice is the result of internal force, by which one portion of ice is dragged past another in a manner so gradual as not necessarily to produce large fissures in the ice, and the consequent sliding of one detached part over another, but rather the effect of a general bruise over a considerable space of the yielding body. According to this view, the delicate veins seen in the glacier, often less than a quarter of an inch wide, have their course parallel to the direction of the sliding effort of one portion of the ice over another. Among other proofs of this fundamental conception that the veined structure is the external symbol of this forced internal motion of a body comparatively solid, Forbes cited a striking instance from the glacier of La Brenva, on the south side of Mont Blanc. In this case the ice of the glacier, forcibly pressed against the naked, rocky face of an opposing hill is turned into a new direction; and in thus shoving and squeezing past a prominence of rock, he observed developed in the ice a "veined structure" so beautiful that "it was impossible to resist the wish to carry off slabs, and to perpetuate it by hard specimens." This perfectly developed structure was visible opposite the promontory which held the glacier in check, and past which it struggled, leaving a portion of its ice completely embayed in a recess of the shore behind it. Starting from this point as an origin, the veined laminae extended backward and upward into the glacier, but did not spread laterally into the embayed ice. They could, however, be traced from the shore to some distance from the promontory into the icy mass. The direction of lamination exactly coincided with that in which the ice

must have moved if it was shoved past the promontory at all. That it did so move was made the subject of direct proof, by fixing two marks on the ice opposite the promontory, one on the nearer, the other on the farther side of the belt of ice which had the lamination best developed. The first mark was fifty feet from the shore, and moved at the rate of 4.9 inches daily; the other mark was 170 feet further off, and moved almost three times faster, or 14.2 inches daily. Throughout this breadth of 170 feet there was not a single longitudinal crevasse which might have facilitated the differential motion. A parallelogram of compact ice, only 170 feet wide, was therefore moving in such a manner that, while one of its sides advanced only a foot, the other advanced a yard. No solid body, at least no rigid solid body, can advance in such a manner; Forbes therefore concluded that glacier-ice is plastic, that the veined structure is unquestionably the result of the struggle between the rigidity of the ice and the quasi-fluid character of the motion impressed upon it, and that this follows, not only from the direction of the laminae, but from their becoming distinct exactly in proportion to their nearness to the point where the bruise is necessarily strongest. The subsequent experiments of Sorby on the cleavage structure of rocks proved that it has arisen as the result of intense lateral compression, and could be imitated in many artificial substances. Tyndall obtained it even in beeswax, the analogy between which and the veined structure of ice is very close.

Though Forbes termed his expression of the laws of glacier motion the "viscous" or "plastic theory," it was rather a statement of fact than an explanation of the physical processes concerned in the descent of glaciers. Against his views it was of course objected that ice is by its nature a brittle solid, and not sensibly possessed of any viscous or plastic quality. But he cogently replied that the qualities of solid bodies of vast size, and acted on by stupendous and long-continued forces, cannot be estimated from experiments on a small scale, especially if short and violent; that sealing-wax, pitch, and other similar bodies mold themselves, with time, to the surfaces on which they lie, even at atmospheric temperatures, and whilst they maintain, at the same time, the quality of excessive brittleness under a blow or a rapid change of form; that even ice does not pass at once, and *per saltum*, from the solid to the liquid state, but absorbs its latent heat throughout a certain small range of temperature (between 28°.4 and 32° of Fahrenheit), which is precisely that to which the ice of glaciers is actually exposed; that, after all, a glacier is not a crystalline solid, like ice, tranquilly frozen in a mold, but possesses a peculiar fissured and laminated structure, through which water enters (at least for a great part of the year) into its intrinsic composition. He insisted that the quasi-fluid or viscous motion of the ice of glaciers is not a theory but a fact. A substance which is seen to pour itself out of a large basin through a narrow outlet without losing its continuity; the different parts of which, from top to bottom, and from side to center, possess distinct though related velocities; which moves over slopes inconsistent with the friction between its surface and the ground on which it rests; which surmounts obstacles, and even if cleft into two streams by a projecting rock, instead of being thereby anchored as a solid would necessarily be, reunites its streams below, and retains no trace of the fissure, leaving the rock an islet in the icy flood,—a substance which moves in such a fashion cannot, Forbes maintained, in any true sense of the word, be termed a rigid solid, but must be granted to be ductile, viscous, plastic, or semifluid, or to possess qualities represented by any of these terms.

which we may choose to adopt as least shocking to our conception of the triteness of ice.

The problem of the cause of glacier-motion cannot yet be considered to be satisfactorily solved.

GLADBACH, usually called BERGISCHE-GLADBACH, a town of Prussia, circle of Mülheim, government district of Cologne, is situated eight miles northeast of the latter town.

GLADBACH, or MÖNCHEN-GLADBACH, a flourishing and rapidly increasing manufacturing town of Rhenish Prussia, capital of a circle in the government district of Düsseldorf, is situated sixteen miles west-southwest of the town of that name.

GLADIATORS, professional combatants with men or beasts in the Roman arena. That this form of spectacle, which is almost peculiar to Rome and the Roman provinces, was originally borrowed from Etruria is shown by various indications. On an Etruscan tomb discovered at Tarquinii there is a representation of gladiatorial games; the slaves employed to carry off the dead bodies from the arena wore masks representing the Etruscan Charon; and we learn from Isidore of Seville that the name for a trainer of gladiators, *lanista*, is an Etruscan word meaning butcher or executioner. These games are evidently a survival of the practice of immolating slaves and prisoners on the tomb of illustrious chieftains, a practice recorded in Greek, Roman, and Scandinavian legends, and traceable even as late as this century to the Indian suttee. Even at Rome they were for a long time confined to funerals, and hence the older name for gladiators was *bustuarii*; but in the later days of the republic their original significance was forgotten, and they formed as indispensable a part of the public amusements as the theater or the circus.

The first gladiators are said, on the authority of Valerius Maximus, to have been exhibited at Rome in the Forum Boarium 264 B.C., by Marcus and Decimus Brutus, at the funeral of their father. On this occasion only three pairs fought, but the taste for these games spread rapidly, and the number of combatants grew apace. In 174 B.C. Titus Flamininus celebrated his father's obsequies by a three days' fight, in which seventy-four gladiators took part. Julius Cæsar engaged such extravagant numbers for his ædileship, that his political opponents took fright, and carried a decree of the senate imposing a certain limit of numbers; but, notwithstanding this restriction, he was able to exhibit no less than 300 couples. During the latter days of the republic the gladiators were a constant element of danger to the public peace. The more turbulent spirits among the nobility had each his band of gladiators to act as a body guard, and the armed troops of Clodius, Milo and Catiline played the same part in Roman history as the armed retainers of the feudal barons or the condottieri of the Italian republics.

Under the empire, notwithstanding sumptuary enactments, the passion for the arena steadily increased. Augustus, indeed, limited the shows to two a year, and forbade a prætor to exhibit more than 120 gladiators, yet allusions in Horace and Persius show that 100 pairs was the fashionable number for private entertainments; and in the Marmor Ancyranum the emperor states that more than 10,000 men had fought during his reign. The imbecile Claudius was devoted to this pastime, and would sit from morning till night in his chair of state, descending now and then to the arena to coax or force the reluctant gladiators to resume their bloody work. Under Nero senators, and even well-born women, appeared as combatants; and Juvenal has handed down to eternal infamy the descendant of the Gracchi that appeared without disguise as a *retarius*, and begged his life from the *secutor*, who blushed to conquer one so noble

and so vile. Titus, whom his countrymen surnamed the Clement, ordered a show which lasted 100 days; and Trajan, in celebration of his triumph over Decebalus, exhibited 5,000 pairs of gladiators. Domitian instituted *venationes* by torchlight, and at the Saturnalia of 90 A.D. arranged a battle between dwarfs and women. Even as late as 200 A.D. an edict was passed forbidding women to fight. How widely the taste for these sanguinary spectacles extended throughout the Roman provinces is attested by monuments, inscriptions, and the remains of vast amphitheaters. From Britain to Syria there was not a town of any size that could not boast its arena and annual games.

Gladiators were commonly drawn either from prisoners of war, or slaves, or criminals condemned to death. Thus in the first class we read of tattooed Britons in their war chariots, Thracians with their peculiar bucklers and scimitars, Moors from the villages round Atlas, and negroes from central Africa, exhibited in the Colosseum. Down to the time of the empire only greater malefactors, such as brigands and incendiaries, were condemned to the arena; but by Caligula, Claudius, and Nero this punishment was extended to minor offenses, such as fraud and speculation, in order to supply the growing demand for victims. For the first century of the empire it was lawful for masters to sell their slaves as gladiators, but this was forbidden by Hadrian and Marcus Aurelius. Besides these three regular classes, the ranks were recruited by a considerable number of freedmen and Roman citizens who had squandered their estates, and voluntarily took the *auctoramentum gladiatorium*, by which for a stated time they bound themselves to the *lanista*. Even men of birth and fortune not seldom entered the lists, either for the pure love of fighting, or to gratify the whim of some dissolute emperor; and one emperor, Commodus, actually appeared in person in the arena.

Gladiators were trained in schools (*ludi*) owned either by the state or by private citizens; and though the trade of a *lanista* was considered disgraceful, to own gladiators and let them out for hire was reckoned a legitimate branch of commerce. Thus Cicero, in his letters to Atticus, congratulates his friend on the good bargain he had made in purchasing a band, and urges that he might easily recoup himself by consenting to let them out twice. Men recruited mainly from slaves and criminals, whose lives hung on a thread, must have been more dangerous characters than modern galley slaves or convicts; and, though highly fed and carefully tended, they were of necessity subject to an iron discipline. In the school of gladiators discovered at Pompeii, of the sixty-three skeletons buried in the cells many were in irons. But hard as was the gladiator's lot, so hard that special precautions had to be taken to prevent suicide, it had its consolations. A successful gladiator enjoyed far greater fame than any modern prize-fighter or athlete. He was presented with broad pieces, chains, and jeweled helmets, such as may be seen in the museum at Naples; poets like Martial sang his prowess; his portrait was multiplied on vases, lamps, and gems; and high-born ladies contended for his favors. Mixed, too, with the lowest dregs of the city, there must have been many noble barbarians condemned to the vile trade by the hard fate of war. There are few finer characters in Roman history than the Thracian Spartacus, who, escaping with seventy of his comrades from the school of Lentulus at Capua, for three years defied the legions of Rome; and after Antony's defeat at Actium, the only part of his army that remained faithful to his cause were the gladiators whom he had enrolled at Cyzicus to grace his anticipated victory.

There were various classes of gladiators, distinguished by their arms or mode of fighting. The Samnites fought with the national weapons—a large, oblong shield, a vizard, a plumed helmet, and a short sword. The Thracians had a small, round buckler and a dagger carved like a scythe; they were generally pitted against the Mirmi-Jones, so called from the fish (*μυρμιόλος*) which served as the crest of their helmet. In like manner the Retiarii was matched with the Secutor: the former had nothing on but a short tunic or apron, and sought to entangle his pursuer, who was fully armed, with the east-net (*jeculum*) that he carried in his right hand; and if successful, he dispatched him with the trident (*tridens*, *fusina*) that he carried in his left. We may also mention the Andabatae, who wore helmets with closed vizors; the Dimacharii of the later empire; the Essedarii, who fought from chariots like the ancient Britons; the Hoplomachi, armed like a Greek hoplite; and the Laqueatores, who tried to lasso their antagonists.

GLADIOLUS, a genus of monocotyledonous or endogenous plants, belonging to the natural order *Iridaceae* and representative of the tribe *Gladioleae*, a group of bulbous plants in which the perianth is irregular, and the stamens unilateral and arched, with the filaments free. It belongs to a subdivision of the *Gladioleae*, in which the segments of the limb of the perianth are very unequal, and is specially distinguished by having the perianth tube curved, funnel-shaped, and widening upward, and by the segments equaling or exceeding the tube in length. About ninety species are described, of which number upward of fifty are from the Cape; and the rest from tropical Africa, the central and southern regions of Europe, Persia, the Caucasus, and the Levant. One species, *G. illyricus*, is found apparently wild in England, in the New Forest, Hampshire. Some of the species have been cultivated for a long period in our flower-gardens, where both the introduced species and the modern varieties bred from them are very ornamental and popular. The stately habit and rich glowing colors of the modern gladioli render them exceedingly valuable as decorative plants during the late summer months. They are, moreover, very desirable and useful flowers for cutting for the purpose of room decoration, for while the blossoms themselves last fresh for some days, the undeveloped buds open in succession, if the stalks are kept in water, so that a cut spike will go on blooming for a considerable period.

GLAMORGAN (Welsh, *Gwlad Morgannwg*), a maritime county of South Wales, bounded on the north by Brecknock and Carmarthen, on the west by Carmarthen and its bay, on the south by the Bristol Channel, and on the east by Monmouth, the boundary line of which is the Rhymney. Its greatest length from east to west is about fifty-three miles, its greatest breadth from north to south about twenty-nine; its coast-line is about sixty miles, and its area 792 sq. miles.

Glamorgan, with the exception of some flat tracts on the borders of the Bristol Channel, consists of a succession of hills and valleys, the country inland growing more and more mountainous, after a broad tract of plain on the south coast, until on the borders of Brecknock its surface is a sea of hills. None of the mountains rise to a great height, the most lofty, Mynydd Llangeinor, being but 1,859 feet, and the escarpment of Craig y Llyn about the same height or a little higher. Yet their bold forms add grandeur to the scenery of the county, and their lower slopes are clothed with picturesque though not large timber.

The valleys of Glamorgan have been long famous for great beauty of scenery. The vale of Glamorgan, some eight miles in breadth, has been truly called the "Gar-

den of Wales," and its climate is so mild that myrtles and other tender plants flourish in the open air. The vale of Neath is known to tourists as the waterfall district of South Wales, the finest falls being betwixt Hirwain and Neath, near the Vale of Neath Railway, viz.: Cilhepstê fall, the three Clwngwyns, the falls of the Pyrdin, Scwd-Einon Gam, Scwd-Gladys, and Scwd Hen Rhydd on the Llech, with Melincourt and Abergarwedd still nearer Neath. The highest of these falls are above eighty feet. Swansea valley has also fine scenery. Other valleys are those of the Rhymney, the Taff, the Rhondda, and the Llwchwr, the first two giving their names to important railways.

The rivers of Glamorgan are not large. The chief are the Rhymney, forming the county's eastern boundary; the Ogwr or Ogmor, which flows into the Bristol Channel near Porth-Cawl harbor; the Taff, which rises in the Brecon Beacon, flows southward through the county, and forms the important harbor of Cardiff; the Neath and Tawe, flowing south into Swansea Bay; and the Llwchwr, which is the boundary of the county on the west, and, falling into Carmarthen Bay, forms the estuary of the Burry river.

The chief geological feature of Glamorgan is the Coal-measures, which are of the greatest thickness near Neath, but extend nearly over the whole country, and are bounded by a narrow band of Millstone Grit and Mountain Limestone, nearly coincident with the county boundary on the north. In the extreme south and southwest the Devonian, Magnesian Limestone, and the lias show themselves.

The climate is mild, and the plains on the coast as well as inland are very fertile. The soil is a deep rich loam, improved by lime. Agriculture is as yet not so forward as it might be with such a soil and climate; but the farms are seldom large, and the buildings are not suited to high farming. The crops chiefly raised are wheat, beans, pease, oats, barley, vetches, turnips, and potatoes. The cattle are of good useful breeds; and good sheep and ponies are reared. Population, (1901), 601,092.

GLANDERS, or **EQUINIA**, a specific infectious disease to which certain animals, chiefly those possessing an undivided hoof, are liable, and which is communicable from them to man. The term farcy is also employed to designate a variety of this affection, but there is no pathological distinction between the two. The disease as it affects animals belongs to the subject of Veterinary Medicine.

Glanders is happily a rare form of disease in man, there being evidently less affinity for its development in the human subject than in the equine species. It occurs chiefly among those who from their occupation are frequently in contact with horses, such as grooms, coachmen, cavalry soldiers, veterinary surgeons, etc., and seems always produced either by direct inoculation of the virus from a diseased animal into the broken skin, or by the respiration of air containing the poison. It is said to have occasionally been transmitted from man to man, but such an occurrence is extremely rare.

A period of incubation, lasting from three to five days, generally follows the introduction of the virus into the system. This period, however, appears sometimes to be of much longer duration, especially where there has been no direct inoculation of the poison. The first symptoms are a general feeling of illness, accompanied with pains in the limbs and joints resembling those of acute rheumatism. If the disease has been introduced by means of an abraded surface, pain is felt at that point, and inflammatory swelling takes place there, and extends along the neighboring lymphatics. An ulcer is formed at the point of inoculation which discharges an offensive ichor, and blebs appear in the

inflamed skin, along with diffuse abscesses, as in phlegmonous erysipelas. Sometimes the disease stops short with these local manifestations, but more commonly goes on rapidly accompanied with symptoms of grave constitutional disturbance. Over the whole surface of the body there appear numerous red spots or pustules, which break and discharge a thick mucous or sanguineous fluid. Besides these there are larger swellings lying deeper in the subcutaneous tissue, which at first are extremely hard and painful, and to which the term farcy "buds" or "buttons" is applied. These ultimately open and become extensive sloughing ulcers.

The general constitutional symptoms are exceedingly severe, and advance with great rapidity, the patient passing into a state of extreme prostration. In the acute form of the disease recovery rarely if ever occurs, and the case generally terminates fatally in a period varying from two or three days to as many weeks.

GLANDS are divided by anatomists into two great classes—viz., true secreting glands and ductless glands. The first class constitute special organs, which are destined for the production of the chief secretions; as, for example, the lachrymal, mammary, and salivary glands, the liver, pancreas, kidneys, etc., while the suprarenal capsules, the spleen, the thymus, and the thyroid belong to the second class. An ordinary secreting gland consists of an aggregation of follicles, all of which open into a common duct, by which the glandular product is discharged. The follicles are contained in the interior cells, which are the active agents in the secreting process, while their exterior is surrounded by a net-work of capillaries, from whose contents the materials of secretion are extracted. The simplest form of a gland is the inversion of the surface of a secreting membrane into follicles, which discharge their contents upon it by separate mouths. The articulatæ (for example, insects) present glandular structures which can be unraveled much easier than the glands of vertebrate animals; and the forms, in all of which a large amount of secreting surface is presented in comparatively little space, are often very graceful. The mammary gland, which is a structure of considerable complexity in the higher mammals, presents a very simple arrangement in the lowest type of this class, the ornithorhynchus, being merely a cluster of cæcal follicles, each of which discharges its contents by its own orifice.

GLANDS, DISEASES OF. The lymphatic glands are subject to enlargement from acute inflammation and abscess, usually in consequence of irritation of the part from which their lymphatics spring, as in the case of scarlet fever, in which the glands of the throat are affected; in gonorrhœa, the glands of the groin, etc. The treatment of such abscesses belongs to the ordinary principles of surgery. A much more troublesome affection of the glands is the slow, comparatively painless, at first dense solid swelling which they undergo in scrofula, which tends slowly, if at all, to suppuration, and sometimes remains for years.

GLANVIL, GLANVIL, or GLANVILLE, RANULPH DE (died 1190), the oldest writer on English jurisprudence and chief justiciary of England in the reign of Henry II., was born at Stratford in Suffolk, but in what year is unknown.

GLANVILL, or GLANVIL, JOSEPH, was born at Plymouth in 1636, and was educated at Oxford university, where he graduated as M.A. in 1658. In 1666 he obtained the cure of Abbey Church at Bath; in 1678 he became probandary of the church of Worcester, and acted as chaplain in ordinary to Charles II. He died at Bath, November 16, 1680, in the forty-fourth year of his age. Glanvill's first work, *The Vanity of Dogmatizing, or Confidence in Opinions, manifested in a Dis-*

course of the Shortness and Uncertainty of our Knowledge, and its Causes, with Reflexions on Peripateticism, and an Apology for Philosophy, 1661, is interesting as showing one special direction in which the new method of the Cartesian philosophy might be developed. It is singular enough that Glanvill, who had not only shown, but even exaggerated, the infirmity of human reason, himself paid a strange tribute to its weakness; for, after having combated scientific dogmatism, he not only yielded to vulgar superstitions, but actually endeavored to accredit them both in his *Scep sis Scientifica*, 1665, and in his *Philosophical Considerations Concerning the Existence of Sorcerers and Sorcery*.

GLARUS, or GLARIS, a canton of Switzerland, is bounded on the north and northeast by St. Gall, on the east and south by the Grisons, and on the west by Uri and Schwyz. Its area is 266 or 267 square miles, its greatest length about thirty-three miles, and its greatest breadth about sixteen. Population, (1901), 32,700.

GLARUS, the capital of the canton, is a flourishing little town on the left bank of the Linth, about 1,495 feet above the sea-level. Its environment is a remarkable one: to the south the Glärnisch rises 6,153 feet; to the northwest the Wiggis, 6,033, and to the east, the Schild, 6,000. The fire of 1861 devastated the greater part of the town, destroying its Gothic church of the tenth century, the casino, the government houses, and all its principal buildings; 2,000 of the inhabitants were rendered houseless, and property to the value of 8,000,000 francs was destroyed. Contributions, however, were sent in from far and near to the amount of 2,754,606 francs, the federal authorities of Switzerland voted a loan of 1,000,000 at two per cent., and the canton furnished a subsidy at 3 per cent.; the town was rapidly rebuilt in a substantial and regular style, and the public edifices restored. Population (1901), about 6,000. ●

GLAS, JOHN, the founder of the sect generally known as Glassites or Sandemanians, was born at Auchtermuchty, Fife, on October 5, 1695. He died in 1773.

GLASSITES (Sandemanians). The Glassite denomination, which has never been a numerous one, is distinguished by a number of peculiarities alike in doctrine, discipline, and worship. One of the most characteristic of its tenets is that which owes its elaboration to Robert Sandeman (1718-1771), the son-in-law of Glas, from whom is derived the name of Sandemanians, by which the sect is principally known in England and America. In a series of letters (1757) to Hervey, the author of *Theron and Aspasio*, he maintained that justifying faith is a simple assent to the divine testimony concerning Jesus Christ, differing no way in its character from belief in any ordinary human testimony. No distinctive theological system, however, has as yet been elaborated from this point of view. In their practice the Glassite churches aim at a strict conformity with the primitive type of Christianity as that is understood by them. Each congregation has a plurality of elders, pastors, or bishops, who are chosen according to what are believed to be the instructions of Paul, without regard to previous education or present occupation, and who enjoy a perfect equality in office. To have been married a second time disqualifies for ordination, or for continued tenure of the office of bishop. In all the action of the church unanimity is considered to be necessary; and if any member differ in opinion from the rest, he must either surrender his judgment to that of the church or be shut out from its communion. To join in prayer with any one who is not a member of the denomination is regarded as unlawful, and even to eat or drink with one who has been excommunicated is held to be a heinous sin. The Lord's

Supper is observed weekly; and between forenoon and afternoon service every Sunday a love feast, at which it is incumbent on every member to be present, is held after the manner of the primitive Christians. Mutual exhortation is practiced at all the meetings for divine service, it being lawful for any member who possesses the gift to speak. The practice of washing one another's feet was at one time observed; and it is still customary for each brother and sister to receive new members, on admission, with a holy kiss. "Things strangled" and "blood" are rigorously abstained from; the lot is regarded as sacred; the accumulation of wealth is regarded as unscriptural and improper, and each member considers his property as liable to be called for at any time to meet the wants of the poor and the necessities of the church. The number of adherents at present belonging to the denomination is probably a little under 2,000.

GLASER, CHRISTOPHER, one of the minor chemists of the seventeenth century, concerning the details of whose life very little is known. A salt (the normal sulphate of potassium) which he showed how to prepare, and the medicinal properties of which he pointed out, was named *Glaseri sal polychrestum*, or salt of many uses. The native sulphate is still known as *glaserite*.

GLASGOW, the most populous city in Great Britain next to London, is situated on the banks of the river Clyde, in the Scottish county of Lanarkshire, about twenty miles above Greenock, where the river spreads out into a noble estuary, with branching lochs running deep into the heart of the Western Highlands. It is within ten hours' railway run (40½ miles) of the metropolis, and an hour and a quarter (forty-five miles) of Edinburgh. The extreme breadth of the city is about three and a quarter miles from north to south, and the extreme length five miles from east to west. The circumference is about ten miles; and the area embraced within the municipal boundaries is now 12,382 acres. The population in 1901 was 735,906. The smaller burghs which have sprung up round Glasgow within the last twenty or thirty years have kept pace with the mother burgh in development, and now contain a population among them of about 70,000. As these burghs are essentially parts of Glasgow, having been formed by the overflow of its population, they ought to be added to the city in any estimate of its size and importance. The population of Glasgow, taking this basis, is therefore close to 800,000. The increase of the population during the present century has been greater perhaps than that of any other city or town of the Old World.

Unlike the "gray metropolis of the north," Glasgow shows rather poorly in the history of Scotland. Its own real history—the history of its commerce and industries—can hardly be dated farther back than the beginning of the last century, when the union of England and Scotland roused it to extraordinary activity the trading spirit of its inhabitants. And yet Glasgow is an old city. Its foundations were laid when the half-mythical Kentigern sat down by the banks of the Molendinar, to teach the rough Celts of Strathclyde the truths of Christianity. It was about the middle of the sixth century that this apostle of truth made his appearance in the west of Scotland, and built his little wooden church on the spot upon which some centuries later his successors reared the noble cathedral which still stands in perfect beauty. One can only guess that the inhabitants of this portion of Strathclyde gathered round the abode and church of St. Mungo, and that as the site was pleasant, and the Molendinar and the Clyde supplied ample store of trout and salmon, the village, under the fostering care of the monks, grew slowly until it became a place of importance. Of that growth, however, nothing

is really known till we reach the twelfth century. In the year 1115, an investigation was ordered by David, then prince of Cumbria, of the lands and churches belonging to the bishopric of Glasgow, and from the deed which still exists it is evident that at that time a cathedral had been endowed. A few years later David succeeded to the Scottish throne on the death of his brother, Alexander I., and among the many endowments he made for religious purposes, we find that he gave to the see of Glasgow the lands of Partick, besides restoring many possessions of which it had been despoiled. Jocelyn was bishop of Glasgow for a long period, and is memorable for the efforts he made to rebuild the cathedral which had been destroyed by fire. He collected funds with so much success that, in 1197, the new structure was sufficiently advanced to be dedicated. The next bishops of note were Bodington and Wisheart. The former carried on the building work of Jocelyn; the latter was a patriotic Scot who resisted the conquering army of Edward I., and was among the first to join in the revolt of Wallace, and to receive Robert Bruce when he was proscribed by Edward and lay under the ban of the church for the murder of the Red Comyn. Wisheart was a prisoner from the year 1306 to the battle of Bannockburn, and he lived to see Bruce firmly established upon the Scottish throne. Bishop Rae deserves mention for having built a stone bridge over the Clyde (1345). Bishop Turnbull was the greatest benefactor the city had till then found; for he was the founder of Glasgow university (1450). He also received a charter from James II. in 1420, erecting the town and the lands of the bishops into a regality. The most notable fact after the Reformation in the history of the Glasgow Church was the Assembly of 1638, which was held in the city, when Episcopacy was finally abjured, the Solemn League and Covenant accepted, and its signature made binding upon all who claimed the ordinances of the Presbyterian Church. The fact that the craftsmen were zealous for the preservation of their fine old cathedral, indicates probably, that the Reformation doctrines were not received so enthusiastically in Glasgow as in many other places in Scotland; but they took deep root latterly, and in the struggles for religious and civil liberty in the seventeenth century the inhabitants were among the foremost to assist and endure in the good cause.

Glasgow owed its erection into a burgh to its ecclesiastic lords. One of these obtained a royal charter from William the Lion in the last quarter of the twelfth century (between the years 1175 and 1178), which made the town a burgh, and gave it a market with freedom and customs. Another charter, it is supposed, was granted in 1190, and, according to a deed dated 1268, the town was governed by a provost and bailies, and had courts of justice for settling disputes among the inhabitants. There are no records, however, till almost quite recent times.

Glasgow was not aware of the vast benefits that were conferred upon her by the union of England and Scotland in 1707. The measure was stoutly resisted by the inhabitants, and its proclamation nearly led to a riot; but the merchants very soon saw that, by the water highway which flowed through the town, they could have access to the profitable trade that had been opened up in North America. Glasgow's situation for the western foreign traffic was the best in Scotland, and inferior to none of the great towns of England. The Treaty of Union put every Scottish port, so far as trade was concerned, on an equal footing with the English ports; and there was no reason why Glasgow should not share in the wealth which, in ever-increasing amount, was yearly coming across the Atlantic. When it became

possible for Glasgow merchants to enter into competition with the merchants of Bristol, companies were formed to carry on the trade with the North American colonies, and a large trade was soon established. Ships were chartered, and, as wealth poured in, were built, and sailed regularly for Virginia, Maryland and Carolina, taking out goods in barter for cargoes of tobacco. In 1760 Glasgow had completely rivaled Bristol in the tobacco trade, and in 1772 its importations were more than half of the entire quantity brought into the United Kingdom. The Virginian trade being exceedingly lucrative, Glasgow flourished under it. The town rapidly extended westward, handsome mansion-houses for the "tobacco-lords" were erected, and the austerity of manners which had come down from the covenanting days was somewhat relaxed. The money made by tobacco found its way into other branches of commerce and stimulated new industries. The tobacco trade, however, received a crushing blow at the outbreak of the American War—a blow from which it never wholly recovered, for, after the war was over, and the thirteen colonies had become the United States of North America, Glasgow was engaged in other commercial enterprises. The distress in the city was keen during the first years of the war, and Glasgow capitalists turned their attention to the West Indies and the cultivation of the sugar cane. The manufacture of cotton goods was introduced also about this time, and proved a new source of wealth and prosperity. Calico printing, which was soon to develop into a great industry, employing thousands of persons, was started at Pollokshaws in 1742; the inkle loom was set up in 1732; glass-making was established in a feeble way in 1730; and the brewing of beer and ale on a large scale was attempted with success. In 1764 James Watt perfected his first model of a steam engine in a small workshop, which had been granted to him by the senatus of the university, within the college walls. From the Treaty of Union down to the end of the eighteenth century, the progress of the city had been remarkable. In 1708 the population was estimated to be upward of 12,000; at the end of the century it was close upon 80,000.

The river has been the fruitful source of the city's greatness. As the accessibility of the water-way became greater year by year, so the commerce and the industries of the city developed, and the material wealth increased. Glasgow, too, is fortunate in being the center of an enormous coal and iron field, in the working of which she has greatly benefited. Her industries, now very numerous, are referred to in detail below. They embrace almost every species of manufacture to be found in Great Britain; and this variety is probably the reason for the all but uninterrupted prosperity of the city, for it is rare that every department of manufacture and commerce is dull at the same time.

The affairs of Glasgow are managed by a corporation consisting of forty-eight representatives of the sixteen wards into which the city is municipally divided, and by one representative from the Trades' and one from the Merchants' House. The lord provost is the head of the corporation, and is assisted in his executive functions by ten bailies.

In 1866 Glasgow was one of the least healthy towns in Great Britain; in 1900 it was nearly as healthy as London. In 1866 the annual death rate was 29.6 per thousand, and continued slightly rising or falling till 1875, when there was a fall to 28.7. This was the year in which the work of the improvement trustees began to tell. In 1900 the death rate fell to 22.0 per thousand, in 1877 it was 24.9, and in 1878 it was 25.0. The improvement scheme has done good otherwise in directing attention to sanitary questions of all kinds. There is

now in Glasgow a public department of health, at the head of which there is a most efficient medical officer, and provision has been made for the isolation of contagious diseases immediately on their breaking out. Great attention is paid to cleansing the city, and fever epidemics, which not long ago were seldom absent, are now very rare, and hardly ever assume large proportions. Crime has almost diminished as one of the results of the city improvements, and its detection is much surer.

There are three fine bridges over the river within the municipal boundaries, and two iron suspension bridges. One railway bridge was erected a few years ago by the City Union Railway Company, and another by the Caledonia Railway Company was recently completed. All the bridges are free. Glasgow is the center of a vast railway system, the Caledonian and Glasgow & South-Western Railways having their termini in the city; these work with the great English lines, the Midland and the London & North-Western Companies.

The public statues in Glasgow are not numerous, though several of them are very fine. Most of them are in George Square.

Of the educational institutions of Glasgow precedence must be given to the university. During the period which intervened between 1577 and 1688 the university underwent many changes; but in the year 1693, each of the Scottish colleges having received a grant of £300 per annum out of the bishops' rents, the Glasgow institution again revived; and having received other public and private gifts, its progress has been since uninterrupted. The academic body of the university consists of the chancellor, the lord rector, the dean of faculty, the principal and vice-chancellor, and the professors. The whole business of the university is transacted in three distinct courts, viz., the senatus, the faculty, and the comitia. There are many bursaries connected with the college, the most important being those bequeathed by Mr. Snell, by Mrs. Black, the widow of the late minister of the Barony church, and by Mr. Orr-Ewing, M.P. for Dumbartonshire. The college buildings in High Street were principally erected in 1593 and 1658. The spire, which was 153 feet in height, possessed a lightning conductor which was reared under the auspices of Franklin in 1772.

Anderson's College, formerly called Anderson's (or the Andersonian) University, was founded by John Anderson, professor of natural philosophy in the university of Glasgow in 1795, and endowed by him with valuable philosophical apparatus, a museum, and a library. It is governed by eighty-one trustees, and its object is to bring literary and scientific education within the reach of the mass of the community.

The libraries open to the public are Stirling's public library, a large collection of literature, and famous for its tracts of the sixteenth and seventeenth centuries, and the Mitchell public library, established a few years ago by the munificence of a citizen of Glasgow, who left about £80,000 for the purpose.

The drama has always been tolerably well patronized in Glasgow, which now contains some half-dozen theaters.

The Chamber of Commerce was instituted in 1783, for the purpose of encouraging and protecting trade, and keeping a watchful eye on whatever might be supposed to affect the commercial interests of Glasgow and its neighborhood. There are eight banks and branch banks in the city, two of them being properly Glasgow institutions; they are all joint-stock companies.

The city is specially well provided with public parks, although not more than a quarter of a century has elapsed since it possessed only one—Glasgow Green.

Glasgow has become almost exclusively a commercial city within the last half century. As wealth increased culture also increased, though more slowly. The university has always been the center of intelligence in the city, and many professors have been conspicuous for their devotion to the applications of pure science to the development of the arts and manufactures. Of the great names connected with this institution it may suffice to mention Baillie, whose letters on the troubles of the seventeenth century, recovered by the late Dr. Laing, of Edinburgh, added considerably to our knowledge of that period, and Professors Adam Smith and Thomas Reid. James Watt, though not a member of the university, was generously protected by it when the burgesses of Glasgow refused to allow him to open shop within the jurisdiction of the trades house and magistrates of the city.

GLASS. The art of glass-making, unlike that of pottery, would appear not to have been discovered and practiced by different nations independently, but to have gradually spread from a single center. No trace of it was observed among the inhabitants of America at the time when the continent was discovered, although considerable progress in arts had been made by some among them, *e.g.*, the Mexicans and Peruvians; but the steps by which it reached China may be indicated with much probability. The credit of the invention was given by the ancients to the Phœnicians, as is shown by the well-known story of the fortuitous discovery by Phœnician merchants, who rested their cooking pots on blocks of natron, and found glass produced by the union under heat of the alkali and the sand of the shore. A glassy mass may, however, be produced in the smelting of many metallic ores, silica being present, while the fuel supplies the alkali; or by the combustion of great masses of reeds or straw, in which the elements of glass are present,—lumps of coarse, imperfect glass being often found on the spot where a stack of wheat has been burned. Now the Egyptians practiced metallurgic operations from a very early period, and vast heaps of straw are, and no doubt have been from the earliest times, accumulated in that country, and probably not infrequently set on fire. The adoption of glass as a substance capable of being made subservient to the use of mankind may therefore be due to the intelligence of some one who noticed its fortuitous production there. Be this as it may, by far the earliest examples of glass existing of which the dates are attested by inscriptions are of Egyptian origin.

The Phœnicians probably derived their knowledge of the art from Egypt; whether this be so or not, they undoubtedly practiced it from a very early period and to a very large extent. Probably much the same processes were employed in Phœnicia and Egypt during some centuries before the Christian era, as they certainly were in Phœnicia, Egypt, and Rome for some centuries after. It seems probable that the earliest products of the industry of Phœnicia in the art of glass-making are the colored beads which have been found in almost all parts of Europe, in India and other parts of Asia, and in Africa.

The Greeks, excellent in the ceramic art, do not appear to have cultivated the art of glass-making at a very early period; but it was probably made in many places on the shores of the Mediterranean for some centuries before the Christian era. At Mycenæ many disks of opaque vitreous pastes were found by Schliemann, and very similar objects at Ialysus in Rhodes; but it is not certain that these may not have been brought from Egypt, where very similar objects have been found, or whether they ought not to be attributed to Greek or to Phœnician artisans. At Camirus in Rhodes, however,

many vessels of glass of very elegant forms have been discovered, which were probably made in the island.

In Etruscan tombs in Italy are also found glass vessels of peculiar character; these are small bowls resembling in form the half of an egg; they are usually of the variety of glass which is called "madrepore," the ground green and transparent, the stars yellow, while patches of color of gold and of filigree glass are sometimes interspersed.

In the first centuries of our era the art of glass-making was developed at Rome and other cities under Roman rule in a most remarkable manner, and it reached a point of excellence which in some respects has never been excelled or even perhaps equaled.

The invention and ingenuity employed by the Roman artisans in producing variety in glass vessels are most remarkable; almost every means of decoration appears to have been tried, and many methods of manipulating glass, which have been considered inventions, have in reality been anticipated by the glass-workers of the period under consideration.

The Romans had at their command, of transparent colors, blue, green, purple or amethystine, amber, brown and rose; of opaque colors, white, black, red, blue, yellow, green and orange. There are many shades of the former as well as of the latter, particularly of transparent blue, and of opaque blue, yellow and green. Of opaque colors many varieties appear to be due to the mixture of one color with another.

These combinations of color were effected in two ways: first, by glasses of two or more colors being combined so as to traverse the entire substance of the object; and, secondly, by the superposition of the one color on the other.

To the former class belong all those termed mosaic and mille fiori, where the process of manufacture was the preliminary union, by heat, of threads of glass into a rod, which, when cut transversely, exhibited the same pattern in every section. Such rods were placed together side by side, and united by heat into a mass which was then formed into cups or other vessels.

The art of glass-making no doubt, like all other art, deteriorated during the decline of the Roman empire, but it is probable that it continued to be practiced, though with constantly decreasing skill, not only in Rome but in the provinces.

Some of the Roman artificers in glass no doubt emigrated to Constantinople, and it is certain that the art was practiced there to a very great extent during the Middle Ages. One of the gates near the port took its name from the adjacent glass-houses.

We have in the work of the monk Theophilus, and in the probably earlier work of Eraclius, about the eleventh century, instructions as to the art of glass-making in general, and then as to that of producing colored, gilt, and enameled vessels, which these writers speak of as being practiced by the Greeks. But we look almost in vain for existing specimens of such works.

Probably at Alexandria, one of the great seats of glass-making, the art survived the conquest of Egypt by the Saracens, for a glass disk serving as a weight has been met with in Egypt bearing the date ninety-six of the Hegira, corresponding with 715 A.D. Numerous later examples leave no doubt that the manufacture of glass continued to exist in Egypt, though perhaps in a languishing condition.

Pliny states that no glass was to be compared to the Indian, and gives as a reason that it was made from broken crystal; and in another passage he says that the Troglodytes brought to Ocelis (Ghella near Babel-Mandeb) objects of glass. We have, however, very little knowledge of Indian glass of any considerable antiquity.

GLASS.

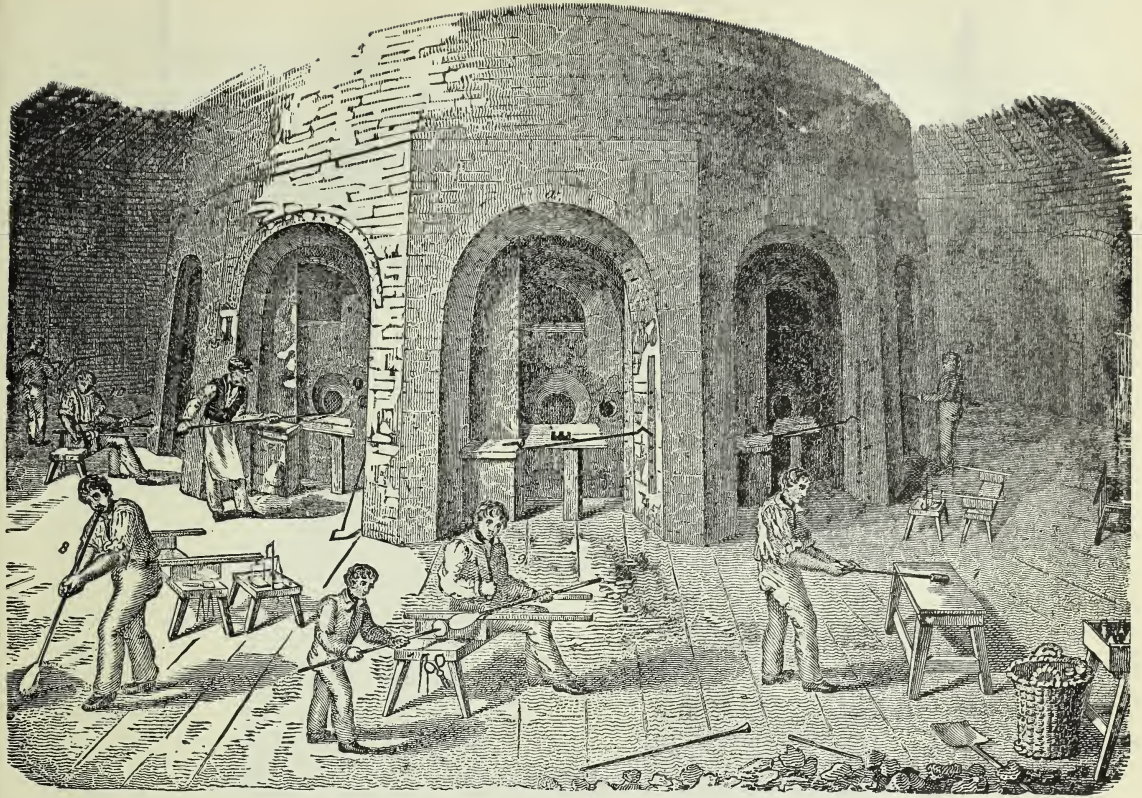


Fig. 1.

FLINT-GLASS MANUFACTORY.

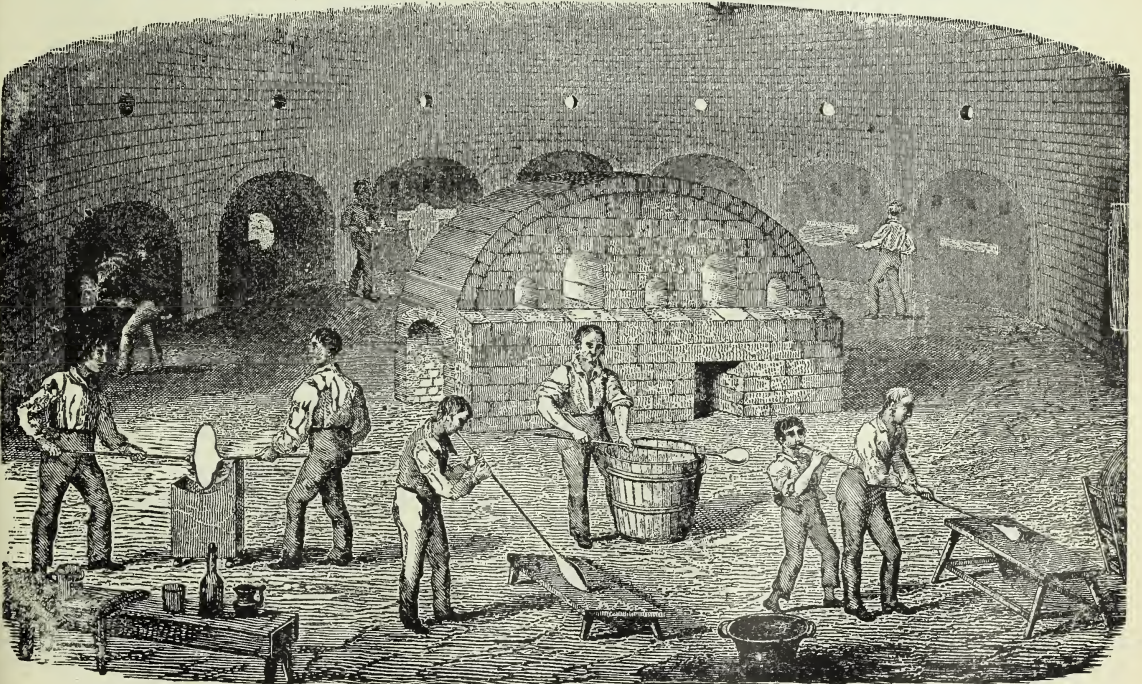


Fig. 2.

INTERIOR OF A CROWN-GLASS HOUSE.

Fig 1.



The diagram is a top-down architectural plan of a rectangular building. The central feature is a horizontal hall containing a "Flag Bar" labeled "Built with 2 in. Bricks, ends up 2 ft 3 in." and "2 ft 3 in." at its ends. On either side of the hall are six circular rooms, numbered 1 through 6. Rooms 1, 2, and 3 are in the top row, and rooms 6, 5, and 4 are in the bottom row. Each circular room has a dashed outer circle and a solid inner circle. The word "Resting" is written above each of these rooms. To the left of the circular rooms is a vertical strip labeled "Back of Boys' Room" and "Back Bar". To the right is a vertical strip labeled "Back of Girls' Room" and "Back Bar". At the bottom of the plan, there are three rectangular sections labeled "Foot Hole 1 ft 4 in.", "Foot Hole 1 ft 4 in.", and "Foot Hole 1 ft 4 in.". A scale bar at the very bottom is labeled "Scale" and "20 Feet".

The history of the manufacture of glass in China is obscure, but the common opinion that it was learned from the Europeans in the seventeenth century seems to be erroneous.

Whether the making of glass in China was an original discovery of that ingenious people, or was derived *via* Ceylon from Egypt, cannot perhaps be now ascertained; the manufacture has, however, never greatly extended itself in China.

In the manufacture of ornamental glass the leading idea in China seems to be the imitation of natural stones. The colored glass is usually not of one bright color throughout, but semi-transparent and marbled; the colors in many instances are singularly fine and harmonious.

The chief source from whence a knowledge of the art of glass-making spread through Europe was probably Rome; in the Roman imperial period glass was undoubtedly made, not only in Italy, but also in France, in Spain, and in all probability at or near Cologne, and perhaps in other places near the Rhine. Whether refugees from Padua, Aquileia, or other Italian cities carried the art to the lagoons of Venice in the fifth century, or whether it was learned from the Greeks of Constantinople at a much later date has been a disputed question. It would appear not improbable that the former was the case, but it must be remembered that articles formed of glass were in the later days of Roman civilization in constant daily use, and that the making of glass was carried on, not as now in large establishments, but by artisans working on a small scale. It seems certain that some knowledge of the art was preserved in France and in Spain, possibly even in England, and it seems improbable that it should have been lost in that archipelago, where the traditions of ancient civilization must have been better preserved than in almost any other place. In 523 Cassiodorus writes of the "innumerosa navigia" belonging to Venice, and where trade is active there is always a probability that manufactures will flourish. However this may be the earliest positive evidence of the existence at Venice of a worker in glass would seem to be the mention of Petrus Flavianus, *phiolarius*, in the *ducale* of Vitale Falier in the year 1090. In 1224 twenty-nine persons are mentioned as *frjolari* (*i.e.*, *phiolari*), and in the same century "marie-gole" or codes of trade regulations were drawn up. The manufacture had then no doubt attained considerable proportions; in 1268 the glass-workers exhibited decanters, scent-bottles, and the like; in 1279 they made, among other things, weights and measures. In the latter part of this century the glass-houses were almost entirely transferred to Murano. From thenceforward the manufacture continued to grow in importance; glass vessels were made in large quantities, as well as glass for windows.

The efforts made in France, Germany and England, in the seventeenth and eighteenth centuries, to improve the manufacture of glass in those countries had a very injurious effect on the industry of Murano. The invention of flint glass in England (about 1620?) brought in its train the practice of cutting glass, a method of ornamentation for which Venetian glass from its thinness was ill adapted.

The fall of the Venetian republic was accompanied by interruption of trade and decay of manufacture, and in the last years of the eighteenth and beginning of the nineteenth century the glass-making of Murano was at a very low ebb.

The fame of Venice in glass-making so completely eclipsed that of Italian cities that it is difficult to learn much respecting their progress in the art.

The history of glass-making in France, Spain, Ger-

many and England offers many points of resemblance. In the first three, and probably in England also, glass was made at the period of the Roman empire; in France about Lyons, as is shown by a monument in the Musée Lapidaire to one Julius Alexander, described as an "opifex artis vitriæ," in Normandy and Poitou, and probably in many other parts. In Spain glass, according to Pliny, was manufactured in many parts of the country, "per Hispanias," but the remains of Roman glass-making have been chiefly in the valleys which run down to the coast of Catalonia, but also near the mouth of the Ebro, in Valencia and in Murcia.

Glass-making in Germany during the Roman period would seem to have been carried on extensively at Cologne, near which city many remarkable glass vessels of peculiar character have been discovered. The art was probably not lost during the period which followed the downfall of the Roman power.

It is not equally clear that glass was made in England, though it is probable that this was the case. Both vessels and window glass have been found in almost all parts of the country, and at Buckholt, near the Roman road from Winchester to Salisbury, the remains of a glass furnace, among which were numerous fragments of glass which may possibly have been of Roman origin, and a fragment of undoubtedly Roman pottery.

Very little has been ascertained as to the practice of the art in either of the four countries during the dark ages, but it would seem to have been preserved in France and Germany, and perhaps also in England and Spain.

In France "vitrarii" are mentioned in several centuries from the sixth to the eleventh; in Germany, as has been shown above, there is ground for believing that the art was practiced in the eighth century; and in the twelfth artisans are found at Cologne with the designation "ustor" attached to their names, which Merlo suggests may probably mean maker of glass. Nothing seems to have been ascertained about the existence of the art in Spain between the Gothic conquest and the thirteenth century, when it was practiced at Almeria by the Moors.

During the mediæval period France produced large quantities of glass, as well in the form of vessels as in that of window glass.

Much glass was no doubt made for windows both in Germany and the Low Countries, during the Middle Ages, and in 1453 mention occurs of a fountain and four plateaux made for Philip the Good, duke of Burgundy, by a glass-maker of Lille; but if artistic objects were made, hardly any examples have been preserved. Glass-makers existed at Vienna in 1221.

In England vessels of glass seem to have been but little used during the Middle Ages; they occur very rarely in inventories, and when they do, as in the calendars of the Treasury of the Exchequer, they are usually described as mounted in gold and silver, or as painted, being probably enameled glass vessels from Constantinople, Damascus, or Venice, objects rather of virtu than of daily use.

In Spain glass was made at Barcelona in considerable quantities in 1324; and Almeria, according to an Araó author of the thirteenth century, was famous for its manufacture of glass. In the fifteenth century the export of glass from Barcelona was considerable; Jeronimo Paulo in 1491 says that glass vessels of various sorts were sent thence to many places and even to Rome.

In the sixteenth century the fashion of using glass vessels of ornamented character spread from Italy into France, England, and the Low Countries.

In Germany Ferdinand I. established a glass-house at

Weidlingen near Vienna, which was to work in the Italian manner; but no great success it would seem attended these efforts.

The branch of glass-making in which the greatest results were obtained in France during the seventeenth century was that of the manufacture of mirrors. In 1665 the services of eighteen Venetians were obtained, and a factory established in the Faubourg St. Antoine at Paris, and another factory was founded at Tour-la-Ville near Cherbourg. These were united and worked with great success; the plates which ornament the "Galerie des Glaces" at Versailles were made at Tour-la-Ville. In 1688, the process of casting plates of glass was first adopted in modern times (for the window glass of Roman times was cast); and thus it became possible to make mirrors of dimensions which could not be attained as long as the plates were produced by blowing. The manufacture was carried on at St. Gobain, still the seat of an immense production of glass.

English glass-making of the seventeenth century is distinguished by one of the most important innovations in the practice of the art which has at any time been introduced, that of using a large proportion of oxide of lead in combination with potash. Glass so made is more brilliant than other kinds, and is known in England as "flint-glass," in France as "crystal." The employment of lead as one of the ingredients of glass was not a discovery, for it had been practiced to a small extent and for certain purposes, as in the imitation of gems by the Romans, and through the Middle Ages. Neither the date when flint glass was made nor the inventor of the process is known.

During this century much art and labor were employed in Germany in the ornamentation of vessels for drinking, such as goblets and wiederkoms. Sometimes they were painted in grisaille, the subjects being battles, processions and the like, sometimes engraved or etched; common subjects are escutcheons with arms, views of cities, ciphers, etc. Many excellent artists worked in these various styles.

Although during the eighteenth and earlier part of the nineteenth centuries progress was made both in the purity and in the beauty of the material (especially in the case of glass for optical purposes), and in the organization and working of factories, it was a period marked in no country by much of novelty or of artistic effort in the manufacture of glass.

The manufacture of colored glass for windows was a consequence of the revival of pointed architecture, and England, France, Belgium and Germany have in this century rivaled each other in its production.

THE MANUFACTURE OF GLASS.

Glass, in its ordinary signification, is a brittle, transparent compound produced by the fusion, at a very high temperature, of silica (silicic acid) with one or more basic substances, one of which, in all cases, must be an alkaline metal. The substances which form the essential basis of all varieties of common glass are (1) silica as the acid element; (2) soda or potash as the alkaline base; and (3) lime and oxide of lead as the alkaline earths. To the alkaline earths commercially employed there ought also to be added baryta and alumina, the former being used in the place of lead, and the latter being a common ingredient in certain kinds of glass.

Various authorities who have investigated the constitution of glass have endeavored to establish a chemical formula for what they term normal glass. The results arrived at, however, by different investigators disagree among themselves; and the balance of opinion is in favor of the view that no such substance as normal glass exists, and that glass does not result from any definite

chemical compounds, but is simply a mixture of silicates, with usually an excess of uncombined silica. The proportions in which the ingredients of glass are present, however, have not only a very great influence on the fusibility of the mass, but these conditions also very materially affect the quality of the substance. In general, the more nearly the proportion of silica approaches the amount necessary to form definite compounds with the basic ingredients, the better and the more stable is the quality of the glass.

Glass is an extremely bad conductor of heat, and from that property springs, in great measure, its brittleness. Owing to this imperfect conductivity it necessarily results that a mass of glass, or a glass object cooling from a state of fusion, becomes cooled and set or solidified on its outer surface before the internal molecules have parted with their heat, contracted, and established themselves in a stable relation to each other. The solidification of the superficial stratum thus necessarily hinders the contraction of the internal portion of the mass, and as the internal molecules cool down a state of tension is created, the central portion tending to draw the surface stratum inward with a force held in check by the strain in the contrary direction of the outer range of molecules. In this condition a very moderate impact is sufficient to determine the fracture of the glass. The high degree of brittleness which results from unequal cooling is exhibited in a very marked manner by the philosophical toy known as "Rupert's drops." Such pear-shaped masses of glass are prepared by allowing molten glass to fall, drop by drop, into cold water, with a finely tapering point. Of course a very sudden and rapid cooling of the surface takes place, while the interior is still at a high temperature, and correspondingly much dilated, the consequence of which is that a state of great tension is established between surface and center. The breaking off of a small portion of the tail is sufficient to destroy the equilibrium established between the hard superficial and the dilate internal molecules; and immediately the whole mass is shattered to dust with explosive violence. Excessive brittleness is overcome by the operation of annealing to which glass is submitted.

The raw materials of the glass manufacture embrace the following principal ingredients: (1) Silica is used in the forms of pure quartz (for very fine qualities of glass), crushed sandstone, pulverized flints, and especially sand of degrees of purity varying in proportion to the quality of the glass to be made. (2) Lime is employed in the form of chalk or marble, either burned or unslaked, and it also must for colorless glass be free from impurities. Of (3) potash and (4) soda any of the ordinary salts except chlorides, but especially sulphates and carbonates, are indifferently utilized, the point of real importance being here also the freedom of the compound from contamination when fine glass is being made. (5) Lead is the characteristic ingredient of a distinct class of glass or which ordinary flint glass is the type. It is usually employed in the form of minium or red lead, partly on account of its fine state of division and partly because by giving off oxygen it helps to purify the metal. (6) Baryta and witherite or baric carbonate have been introduced with much success as a partial substitute for alkali in soda or potash glass, and for a part of the lead in the ordinary flint glass, and in all probability barium compounds are destined to occupy a much more important place in glass manufacture than hitherto they have done. (7) Cullet or waste and broken fragments of the special kinds of glass to be made is an important and essential ingredient, being added to the extent of about one-third of the whole charge in the melting and preparation of glass. These materials constitute the

essential ingredients which go to the formation of glass. In coarse varieties, such as bottle glass, alumina and iron are present, but their presence simply results from the inferior and impure nature of the raw materials employed, and are neither essential nor desirable. Some portion of alumina, too, is taken up from the pots in which the materials are melted. Bleaching or oxidizing agents are also employed to produce a high degree of colorlessness in clear glass, and for this purpose peroxide of manganese, arsenious acid, and nitrate of potash are the materials generally used. These bodies oxidize carbon compounds which may be present, and neutralize to a large extent the color yielded by iron by converting its protoxide into peroxide. Too much manganese, however, gives the glass a reddish tinge, and excess of arsenic produces a milky cloudiness. The requisite proportions of the raw materials ground and prepared are intimately mixed with the aid of a mixing apparatus, and in this form constitute the "batch." The growth of the glass-making industry in the United States may be gathered from the fact that the number of establishments in this trade has increased from 112 in 1860, with \$6,133,000 of capital, to 355 in 1900, with an aggregate capital of \$61,423,903, and an annual value of products amounting to \$56,539,712.

Melting Pots.—These pots or crucibles are made of the finest fire-clay. Great care is requisite in the selection, and in cleansing the clay from extraneous particles, the presence of which, even in the smallest degree, will injure the pot. Pots last upon an average from eight to ten weeks, and they form a costly item in the manufacturing operations, as each pot is worth on an average about £10; and many of them, notwithstanding all care, crack and give way as soon as they are placed in the melting furnace. For all varieties of glass, excepting lead glass, open pots in the form of a truncated cone are employed; but for flint glass a covered pot with an opening at the side is essential.

Furnaces.—A glass-melting furnace or oven is a modified form of reverberatory furnace, which assumes many different shapes and arrangements according to the kind of glass to the manufacture of which it is devoted, and the nature of the fuel used. The form assumed by melting furnaces is, in general, square or oblong for sheet and plate glass making, and circular in English flint-glass making. The fire-space or grate occupies the center of the furnace, and the fire, when fuel is used for direct heating, is either fed or stoked from both ends, or raised from under the bars by a patent method. The fire-grate is usually on a level with the floor of the house in which it is erected, but under it is an arched subterranean passage forming the "cave" or ash-pit, both ends of which extend to the open air outside the glass-house. The fire-grate bars are placed in the top of this arched passage, which thus serves as a canal for the atmospheric air required to maintain combustion within the furnace; and for regulating the admission of air, and so controlling the heat, there are doors at both ends of the archway. In some cases two such arched passages at right angles to each other, and intersecting at the fire-bars are constructed, so that either can be used according to the prevailing direction of the wind, etc. In general no flue or chimney is directly connected with the furnace, the only exit for the products of combustion being the working holes, and thus heat is directed around and over each pot placed opposite a working hole in the furnace. Within the furnace, around the grate space in the case of circular furnaces, or on both sides of it in quadrangular furnaces, is a raised bank or narrow platform termed the "siege" on which the melting pots are placed. The number of pots arranged in a furnace vary from four to

ten, and each is reached, either for charging or for working off the prepared metal, by means of "working holes" in the side of the furnace situated directly over the pots. The general form and construction of a six-pot crown-glass furnace, which also may be taken as the type of sheet and plate-glass furnaces, is shown in full page plate, where fig. 3 is a ground plan at the level of the siege of a common form of furnace, while in fig. 1 is seen a front elevation of the same furnace, 1, 2, and 3 being the working holes, 4, 5, 6, and 7 pipe-holes for heating the blowing pipes, and 8, 9, and 10 foot-holes for mending the pots and sieges. The furnace is covered with a low-roofed crown or dome, and the whole structure is bound together with a system of iron bars. The materials used in the construction and lining of all furnaces must be selected with the utmost care, and built with special regard to the enormous temperature to which they are subjected.

An English flint-glass furnace furnishes the type of circular furnaces. Usually a large number of pots, sometimes ten, are provided for in such a furnace, because, the objects made in flint glass being in general of small size, the metal is worked off only slowly, and a large number of glass-blowers can be accommodated at the separate work-holes. The arrangement of the cave and fire-grate are the same as in the case of square or oblong furnaces, but flint-glass furnaces differ from the prevailing rule in others by being provided with a system of flues and chimneys, one flue being placed between each pair of pots. The general appearance presented within a flint-glass house is illustrated in full page plate, fig. 1.

In the year 1861 Dr. C. W. Siemens introduced a form of furnace in which the use of melting pots was altogether abandoned, and the batch was introduced into, melted in, and worked from a tank, which occupied the whole bed of the furnace. This furnace he heated from the sides by means of his well-known regenerative gas system. In 1872 he effected a further development of the tank furnace by dividing the tank, on the principle of his melting pot, by means of two floating bridges or partitions into three compartments.

The whole of the pots in a common furnace are charged or filled with the prepared "batch" at the same time. Immediately the heat is forced, and the stoking must thereafter be carefully regulated to maintain the high temperature. As the mass begins to fuse it settles down and occupies considerably less space in the pot, to which thereon a second quantity of material is added, and generally a third portion is subsequently filled in so as to have at the close of the melting process as large a quantity of metal as possible. When the fusion is complete, a scum, composed of uncombined salts, and known as glass gall or sandiver, rises and collects on the surface. It consists almost entirely of sulphate of soda, with sulphate of lime, and a small percentage of chloride of sodium. This scum of glass gall is carefully removed with a perforated scoop, and the heat of the furnace is then forced to the most intense degree with the view of rendering the metal as fluid and limpid as possible, so as to free it from all included gaseous bubbles which it still contains. This process of "fining," "refining," or hot-stoking, as it is indifferently termed, involves a temperature which is estimated in certain cases to reach from 10,000° to 12,000° Fahr.; and the operation is sometimes assisted by stirring the molten mass with a pole of wood, in a manner analogous to the poling of copper in the refining of that metal. Throughout the operation of melting, test pieces are periodically withdrawn from the pots for the purpose of observing the progress and condition of the glass. When it is found that the vitrification is complete and the object of refin-

ing fully accomplished, the heat of the furnace is considerably reduced, so that the glass may be brought into that condition of viscosity in which it is capable of being worked. In contradistinction to the refining and hot-stoking period, this is known as cold-stoking.

Glass Working.—The means by which melted glass is caused to assume its varied forms for use are (1) by blowing; (2) by casting; and (3) by pressing in molds—an operation in which the other two processes may be partly combined. Minor manipulative processes which do not fall under any of these heads are called into action; but these are for the most part merely subsidiary to the others, which really comprehend all the lines along which the formation of glass proceeds.

Having regard principally to the forms into which the glass is worked and the uses to which it may be applied, the following classification embraces the principal departments of the glass-making industry.

I. Flat glass—Crown glass; sheet glass; plate glass.

II. Hollow glass—Flint glass, blown; Bohemian glass; Venetian glass; bottle glass; slag glass (Britten's); tube and gage glass. III. Pressed and massive glass—Flint glass; optical glass; strass; rod glass, marbles, and beads. IV. Colored, opaque, and enamel glass, including glass mosaics and hot cast porcelain, etc.

Crown Glass.—This, with sheet or cylinder glass, forms all ordinary blown window glass. Both varieties are precisely the same in composition.

In manufacturing crown glass, the metal being brought to a proper condition for working, the "gatherer" dips into the pot of metal an iron pipe or tube six or seven feet in length, of the shape of a rocket with a mouth-piece at one end, heated at that end which takes up the glass, and by turning it gently round, gathers about one and one-half pounds of liquid glass on the end of it. Having allowed this to cool for a little, he again dips the rod into the pot, and gathers an additional quantity of from two and one-half to three pounds. This is also permitted to cool as before, when the operation of dipping is again repeated, and a sufficient quantity of metal, from nine to ten pounds weight, is "gathered" to form what is technically called a table or sheet of glass. The rod, thus loaded, is held for a few seconds in a perpendicular position, that the metal may distribute itself equally on all sides, and that it may, by its own weight, be lengthened out beyond the rod. The operator then molds the metal into a regular form, by rolling it on a smooth iron plate called the "marver," a term corrupted from the French word *marbre*. He then blows strongly through the tube, and thus causes the red-hot mass of glass to swell out into a hollow, pear-shaped vessel. The tube, with the elongated sphere of glass at the end of it, is then handed to the "blower," who heats it a second and third time at the furnace, pressing the end, between each blowing, against the bullion bar, so called from the part thus pressed forming the center of the sheet or "bull's eye," and by the dexterous management of this operation, the glass is brought into a somewhat spherical form. The blower now heats it a third time at the "bottoming hole," and blows the metal into a full-sized flattened spheroid. When this part of the process has been completed, and the glass has been allowed to cool a little, it is rested on the "casher box" and an iron rod, called a "pontil," or punty rod, on which a little hot metal has been previously gathered, is applied to the flattened side, exactly opposite the tube, which is detached by touching it with a piece of iron, dipped beforehand in cold water, leaving a circular hole in the glass of about two inches diameter. Taking hold of the punty rod, the workman presents the glass to another part of the furnace called the "nose hole," where the aperture made by its separation

from the tube is now presented and kept until it has become sufficiently ductile to fit it for the operation of the flashing-furnace. While here, it is turned dexterously round, slowly at first, and afterward with increasing rapidity; and the glass yielding to the centrifugal force, the aperture just mentioned becomes enlarged. The workman, taking great care to preserve, by a regular motion, the circular figure of the glass, proceeds to whirl it round with increasing velocity, until the aperture suddenly flies open with a loud rustling noise, which has been aptly compared to the unfurling of a flag in a strong breeze; and the glass becomes a circular plane or sheet of four and one-half feet diameter, of equal thickness throughout, except at the point called the bullion or bull's eye, where it is attached to the iron rod. The sheet of glass, now fully expanded, is moved round with a moderate velocity until it is sufficiently cool to retain its form. It is carried to the mouth of the kiln or annealing arch, where it is rested on a bed of sand and detached from the punty rod by a shears. The sheet or table is then lifted on a wide pronged fork, called a faucet, and put into the arch to be tempered, where it is ranged with many others set up edgewise, and supported by iron frames to prevent their bending. From 400 to 600 tables are placed in one kiln. A sketch of the interior of a crown-glass house, during the progress of these operations, has been given in full page plate, fig. 2. The kiln having been clayed up, the fire is permitted to die out, and the heat diminished as gradually as possible. When the glass is properly annealed, and sufficiently cold to admit of its being handled, it is withdrawn from the oven after the removal of the wall built into the front of the arch, and is then quite ready for use. The largest sized tables of crown glass made will cut into slabs thirty inches across, from which squared pieces measuring thirty-eight by twenty-four or thirty-five by twenty-five inches may be obtained.

Sheet Glass, as already mentioned, is the same in composition as crown glass, which it has now entirely supplanted.

Sheet-glass making involves two principal operations: (1) the blowing of the cylinder, and (2) the opening, flattening, or spreading of the glass. The structure and internal arrangements of the melting furnace is practically the same as in the case of crown glass. When the metal is ready for working, the workmen take their stations, each having his own pot and stage and also an assistant, and commence making the cylinders. After gathering the quantity of metal required (which on an average amounts to 20 lbs.), the workman places it in a horizontal position in the large hollow of a wooden block, which has been hollowed so that, when the workman turns the metal, it shall form it into a solid cylindrical mass. In the meantime the assistant, with a sponge in his hand, and a bucket of water by his side, lets a fine stream of water run into the block, which keeps the wood from burning, and also gives a brilliancy to the surface of the glass. The water, the moment it comes in contact with the glass, is raised to the boiling point, and in that state does no injury to the metal; but it is only when the metal is at a high temperature that such is the case; for, whenever the glass is cooled to a certain degree, it immediately cracks upon coming in contact with water. When the workman perceives that the mass of metal is sufficiently formed and cooled, he raises the pipe to his mouth at an angle of about seventy-five degrees, and commences blowing it, at the same time continuing to turn it in the wood block, till he perceives the diameter to be of the requisite dimensions, which are usually from eleven to sixteen inches. The workman then reheats his cylindrical mass, and when it is sufficiently

softened, commences swinging it over his head, continuing to reheat and swing till he has made it the desired length, which is commonly about forty-five inches. It is now a cylinder of say forty-five inches long by twelve inches in diameter, one end being closed, and the other having the pipe attached to it. The workman begins to open the end which is closed, for which purpose he incloses the air in the cylinder, by stopping the aperture of the pipe with his finger; and then placing the close end of the cylinder toward the fire, it becomes softened, while at the same time the air within is expanding, and, in about thirty seconds, the softened glass at the extremity of the cylinder gives way, forming an aperture. The workman then turns the cylinder round very quickly, and, by keeping the opened extremity warm at the same time flashes it out perfectly straight. If the burst edges are ragged in appearance they are trimmed by cutting with a pair of scissors before finally expanding. The bursting of the end of a thick heavy cylinder has to be determined by allowing a glowing drop of glass to fall on the spot to be burst before presenting it to the fire. The other end, which is attached to the pipe, has now to be cut off, and is done in the following manner: The workman, having gathered a small quantity of metal on the pontil, draws it out into a thread of about one-eighth of an inch in diameter, laps it round the pipe end of the cylinder, and, after letting it remain there for about five seconds, withdraws it suddenly, and immediately applies a cold iron to the heated part, which occasions such a sudden contraction, that it cracks off where the hot string of glass has been placed round it.

Flattening.—The cylinder so blown and detached is now allowed to cool; and, previous to its flattening, the burst extremity being thinner than the remainder, and slightly contracted at its edge, has to be removed to the depth of about two inches. For this purpose the cylinder is placed vertically in the jaws of a cutting instrument, having a diamond cutter, pressing by a spring, inside the glass. The cutter moves by small wheels on the table on which it is placed, and being pushed around the cylinder it makes an accurate cut of uniform height. The cylinder has then to be split longitudinally to allow it to be opened out to a flat sheet. To accomplish this the practice was formerly to lay the cylinder horizontally on a bench, and draw a red-hot iron two or three times along the inner surface at the line of desired fracture. Now the splitting is done with a diamond cutter fixed in the cleft of a stick and guided from end to end of the cylinder by a straight-edge laid within it. The cylinder is now ready to be taken to the flattening kiln, which consists of two chambers built together, the one for flattening the cylinders, the other for annealing the sheets, the former being kept at a much higher temperature than the latter. The cylinder, after being gradually reheated, is placed in the center of the flattening oven, upon a smooth stone, with the split side upward. In a short time it becomes softened with the heat, and by its own weight falls out into a flat square sheet of forty-five inches by thirty-six. The flattener, with a piece of charred wood, rubs it quite smooth, and then places it on edge in the annealing arch, where it remains about three days to be annealed.

Polished sheet glass is known in commerce as patent plate glass, to distinguish it from the ordinary polished cast-plate. The polishing process involves two operations—smoothing and finishing or polishing. The smoothing is done on a thick slab of slate, which must possess a surface as smooth and level as possible. This is covered with a piece of wet cotton cloth, and the sheet of glass to be smoothed being laid thereon, by gentle pressure all air is expelled from between the surfaces, and the atmospheric pressure then keeps the glass

firmly in position. The process of smoothing and the subsequent finishing are from this point the same as in the case of ordinary plate glass, under which head these operations will be detailed. It is only selected plates of fine clear metal that are used for polishing.

Plate Glass is manufactured by a process entirely different from any of those yet described, consisting as it does of glass cast and spread in sheets. As plate glass is invariably thicker than blown sheet, it is of the utmost consequence that the "metal" should be prepared from the purest possible materials, and that the founding or melting should be done with great care to ensure the expulsion of air-bubbles. The materials are melted in furnaces and pots of the ordinary construction, but in some cases the melting pots are of greater capacity, and contain charges of from two to two and a half tons.

The casting table is a heavy, thick, flat table of cast-iron, of a length and breadth exceeding the size of the largest plate of glass which may be cast on it. At one end is placed a heavy cast-iron roller, the full breadth of the table, and fitted to roll the whole length of the table by means of spur wheels working into gearing along its sides. The cast-iron roller determines the thickness of the glass by the height at which it is caused to roll above the table, and that height is regulated by placing narrow strips or ribs of metal of the required thickness of the glass along the edges of the table on which the two extremities of the roller bear as it revolves. The breadth of the plate, again, is determined within the limits of the table by the two sides of the "gun," an apparatus consisting of two plates of cast-metal, placed in front of the roller, and bolted together by cross bars at a distance apart which can be easily altered and adjusted, according to the breadth of plate the apparatus is intended to control. The edge of the plates abutting against the roller are accurately fitted to roller curvature, and thus they and the roller form three inclosing sides for the molten mass poured on the table, and as they travel forward they carry in front of them all the semi-fluid mass except the uniform layer which represents the distance between the moving surface of the roller and the surface of the casting table on which the glass is spread. As the glass does not instantly solidify the moment the roller has passed over and spread it into a sheet, the edges generally assume a rounded and somewhat wavy cast-like appearance. Immediately the plate has sufficiently solidified to bear moving, it is taken to the annealing furnace, the heat of which has been carefully raised to the proper pitch. The sole of the annealing oven on which the plate is to rest (for with large plates any piling on edge is impracticable) must be as smooth and level as possible, since the still semi-plastic mass molds itself to the surface on which it is laid. As the oven only accommodates a single plate of the largest dimensions, and since the annealing process occupies several days, a large number of ovens, occupying a great space and involving the expenditure of much labor and fuel, are needed in works where many plates are cast. In dealing with plates of small size, they may be laid horizontally on the furnace bed for a little till they come to the furnace temperature, after which they are piled up on edge in twenties or thirties, leaning against a range of iron bars running across the furnace. When the plates have been deposited in the annealing oven, the openings are all carefully stopped up, and the furnace, with its contents, is cooled by slow degrees down to a temperature at which the glass may safely be withdrawn and exposed to ordinary atmospheric influences. The cooling of such furnaces is now hastened, as far as the safety of the plates and the completion of the annealing will permit, by allowing cold currents of air to pass under their sole.

The plates, as withdrawn from the annealing oven, have a very irregular, rough, undulating surface, and although the glass is perfectly pure, they have, owing to their uneven surface, no transparency. In this condition they constitute the "common rough plate" of commerce, and as such they are extensively used for the glazing of roofs, for floor and cellar lights, and generally in positions where light without transparency is requisite.

Polishing.—When the annealed plates are withdrawn from the oven they are carefully examined for any defects, such as spots, air-bells, etc., which they frequently exhibit. If serious defects are found, the plates are cut into the largest pieces which can be obtained free from flaws, and the selected pieces are then submitted to the operations of polishing, consisting of—(1) grinding, (2) smoothing, and (3) polishing. Various forms of machine have been devised and introduced for effecting these operations. The grinding and smoothing table consists of a great revolving flat table, with a strong fixed bar, stretched across it about ten inches above its surface, to which two runner-frames, shod with iron, are pivoted. The glass to be ground is cemented with plaster of Paris on the surface of the table, and the runner-frames rest on the surface. When the table is set in motion, each oblong runner-frame has communicated to it a revolving motion also, owing to the excess of friction brought into action by the more rapid revolution of the outer edges of the revolving table. The effect of these compound revolutions is that every point of the surface of the glass is equally and uniformly abraded, when the apparatus in revolution is fed with sharp sand and water. When a level surface is thus prepared, the smoothing process is next begun on the same table, the only difference being that emery powder of increasing degrees of fineness is substituted for the sand, and as the operation approaches completion the utmost care must be exercised as to the purity and uniformity of the emery, seeing a single particle of grit would effectually destroy the smoothness of a whole plate. The quality of the emery is thus of essential consequence, an ingenious apparatus is brought into use for arranging the sizes by means of a current of water of diminishing velocity, obtained by passing a uniform stream with agitation successively through cylinders or troughs of increasing size. In these troughs the emery powder is deposited in increasingly fine division, according to the growing capacity of the trough and the consequent slow replacement of its contents. The last touches of the smoothing process can only be given by the hand, which at once detects any appearance of grittiness. Both sides of the glass are in succession submitted to these operations, after which it is again bedded in plaster and fixed on the polishing table. The polishing is done with reciprocating rubbers, covered with fine felt, and supplied with rouge (peroxide of iron) in a liquid state. While a reciprocating motion is communicated to the rubbers, the table itself moves backward and forward in a transverse direction, so that all parts of the plate are equally brought under the polishing influence of the rubbers. About forty per cent. of the weight of the rough plate is removed in the three polishing operations.

Flint Glass or Crystal.—The name flint glass originated in the circumstance that at first the silica used in the manufacture of that variety of glass was in the form of ground flints.

Flint glass is a compound entirely different from those above described, consisting as it does of a silicate of potassium and lead. As is the case with all kinds of glass, its composition and the proportion of ingredients used in its preparation vary widely.

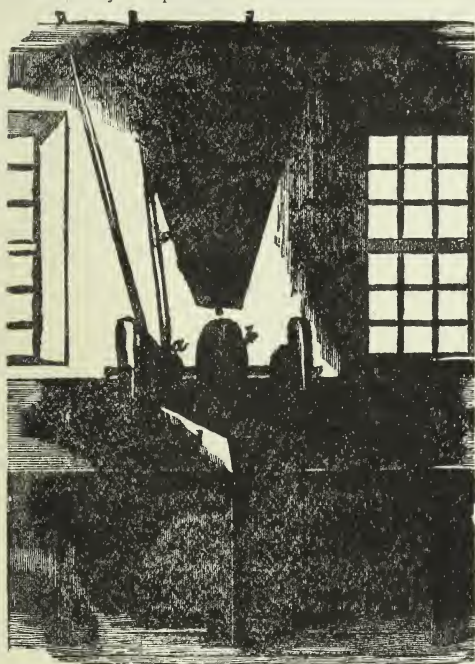
Flint glass is in no case used for architectural or structural purposes, but its purity and luster peculiarly fit it for table glass, ornamental objects, glass globes and lusters, and for imitations of gems and precious stones. For the latter purpose a dense glass called strass, appropriately colored when necessary, is employed, and a glass of still greater density and refractive power is used for optical purposes. The softness of flint glass adapts it for engraving, cutting and polishing; and these methods of ornamenting the finished glass are very much employed.

Fig. 1, full-page plate, represents the various arrangements, tools, and processes connected with a flint-glass house, the building in the center being the large cone or chimney built over the furnace, which is seen through the arches *a*. At 5 and 6, men are seen at the working holes withdrawing metal from the pots on their long iron tubes; 7 is the maver on which the gathering is rolled till it acquires a circular shape; at eight a blower is seen in process of expanding a gathering of glass by blowing; and at nine a servitor or second man is attaching a pontil or lump of metal he has gathered on a pontil or ponty to the end of a blown globe of glass. The two masses of glass are thus united together, and that attached to the hollow tube is separated by touching it, near to where the tube enters the globe, with a small piece of iron wetted with water. By this means the glass cracks, and a smart blow on the iron tube completes the disunion. The workman now takes the punty from his assistant, and laying it on his chair arm, rolls it backward and forward with his left arm, while with his right he molds it into the various shapes required by means of a very few simple instruments. By one of these, called a pucellas, the blades of which are attached by an elastic bowlike a pair of sugar-tongs, the dimensions of the vessel can be enlarged or contracted at pleasure. Any superfluous matter is cut away by a pair of scissors. For smoothing and equalizing the sides of the vessel a piece of wood is used. After the article is finished it is detached from the punty and carried on a pronged stick to the annealing oven.

The annealing oven or leer for flint glass is a low arched furnace, generally of considerable length, with several openings at each end between which narrow lines of rails run. On these rails, small wagons, or trays mounted on four wheels, are placed, and the articles to be annealed are filled into such wagons. They are slowly pushed to the hottest part of the chamber, and passing that point they very gradually approach the cold end of the oven, from which they are withdrawn fully annealed. As each wagon is withdrawn at one end, another is entered at the other, so that the line from end to end is kept constantly full. The ordinary method of gradually decreasing the temperature around the articles stationary in the leer is also practiced.

The sparkle and brilliancy of flint glass is developed by the process of grinding and polishing technically called glass-cutting. In the illustration is seen a representation of a glass-cutter's mill, *a* being the pulley and band communicating motion to the mill, *b*, which is made of wrought or cast iron. Over it is suspended a wooden trough or cistern *c*, containing a mixture of sand and water, which is fed on the wheel as required for the operation of grinding. Smoothing is done on a wheel of fine sandstone to which water alone is applied, and for polishing, a wooden wheel supplied with emery, and finally with putty powder (oxide of tin), is employed. The trough *d* under the wheel receives the detritus of the grinding and other operations. The articles are held in the hand, and applied to the mill while rotating.

The punty marks are ground off tumblers, wine-glasses, and the like, by boys holding them on small stone mills. Ground or obscured glass is made by rubbing the surface with sand and water. Iron tools fixed on a lathe and moistened with sand and water are used to rough out the stoppers and necks of bottles, which are completed by hand with emery and water. Engraving is the production of ornamental surfaces by a fine kind of grinding mostly done with copper discs revolving in a lathe. Etching is variously done by submitting the portions to be etched or bitten to the influence of hydrofluoric acid, or the sand-blast, the remainder of the glass being stopped off or protected by a coating of wax or some pitchy compound.



Glass-Cutter's Mill.

Pressed Glass.—The most brilliant effect is produced by cutting, but molding or pressing (claimed to be the invention of a Massachusetts carpenter) is much cheaper, and this branch of the art has now reached a high state of excellence. A metal that melts at a comparatively moderate heat, and does not quickly pass from the plastic state, is essential for success in pressed glass making, because it has not only accurately to fill all the intricacies of the mold, but it must also be susceptible of fire-polishing. This operation consists of a reheating sufficient to melt a thin superficial stratum of the glass, whereby the roughness and obscurity of surface incidental to molding is removed, and a smooth, brilliant effect brought out, inferior only to the sparkling appearance produced by cutting. The molds for pressed glass are made of iron or bronze; with great accuracy of surface; and they are, in use, kept a little under a red heat. The various segments of the mold are so hinged or connected as to close and leave internally a space representing the form and size of the article to be made, the internal hollow not being produced by blowing, but by the plunger of the press under which the mold is placed. The required quantity of metal being dropped into the mold, the plunger de-

scends and forces it into all parts of the cavity, completing immediately the formation of the article, which is then fire-polished by reheating, and afterward annealed.

Baryta Glass.—Baryta, it appears, can be used as a partial substitute for the alkalis in glass-making; and indeed it was affirmed by Peligot that carbonate of baryta could altogether supplant either potash or soda, and yield a glass perfectly free of alkali. Such a glass is, however, without practical value; but baryta may be used in the place of either lead or lime, to produce an easily fused dense glass much more brilliant than common glass, and in appearance and properties intermediate between that and flint glass.

Bottle Glass.—This department of glass manufacture is of importance on account of its enormous extent; and although the raw materials employed in the trade are coarse and impure, and though the finished product has little appearance of excellence, the quality of the glass is in the highest degree important.

The following is an outline of the process of making a common bottle. After the metal has been skimmed, the person who begins the work is the gatherer, who, heating the pipe, gathers on it a small quantity of metal. After allowing this to cool a little, he again gathers such a quantity as he conceives to be sufficient to make a bottle. This is then handed to the blower who, while blowing through the tube, rolls the metal upon a stone, at the same time forming the neck of the bottle. He then puts the metal into a brass or cast-iron mold of the shape of the bottle wanted, and, continuing to blow through the tube, brings it to the desired form. The patent mold now in use is made of brass, the inside finely polished, divided into two pieces, which the workman, by pressing a spring with his foot, opens and shuts at pleasure. The blower then hands it to the finisher, who touches the neck of the bottle with a small piece of iron dipped in water, which cuts it completely off from the pipe. He next attaches the punty, on which is a little metal gathered from the pot, to the bottom of the bottle, and thereby gives it the shape which it usually presents. This punty may be used for from eighteen to twenty-four dozen of bottles. It is occasionally dipped into sand to prevent its adhering to the bottle. The finisher then warms the bottle at the furnace, and taking out a small quantity of metal on what is termed a ring iron, he turns it once round the mouth, forming the ring seen at the mouth of bottles. He then employs the shears to give shape to the neck. One of the blades of the shears has a piece of brass in the center, tapered like a common cork, which forms the inside mouth; to the other blade is attached a piece of brass, used to form the ring. The bottle is then lifted by the neck on a fork by a boy, and carried to the annealing arch, where the bottles are placed in bins above one another. This arch is kept a little below melting heat, till the whole quantity, which amounts to ten or twelve gross in each arch, is deposited, when the fire is allowed to die out.

Optical Glass is of two principal kinds—flint and crown—the combination of these two, with their different refractive powers, being necessary to produce perfect achromatism in the lenses of telescopes. For astronomical telescopes, for microscopes, and for all delicate scientific instruments in which optical glass occupies a place, glass of the utmost purity, transparency, freedom from color, streaks, and striae is of the highest importance; and to secure these qualities to the fullest extent much care, trouble, and expense are requisite.

Optical flint glass contains more lead, and is consequently heavier and more refractive, than the quality used for common purposes. It is made in a furnace

having a single covered pot, and the secret of successful manufacture consists in constantly stirring the mass while it is in a molten condition so as to keep the heavier lead silicate from falling to the bottom. For the very highest qualities of optical glass, the contents of the pot are most scrupulously cleared, and the stirring is continued after the heat is lowered till the contents are cooled down to little more than a red heat. The furnace is then closed and the metal is allowed to cool and anneal gradually in the pot within the furnace. When withdrawn the pot is broken, and the mass of glass is polished on two opposite sides so that any imperfections may be detected by examination. From the mass, cut horizontally, perfect discs of such size as can be formed are then obtained. Optical glass is also blown into thick cylinders, and cast in slabs from quarter inch to one inch in thickness.

Strass.—Remarkably faithful imitations of every kind of precious stone can be made from suitably prepared and, when necessary, colored glass. The transparent basis from which artificial precious stones is prepared is called *strass* or *paste*, a material which must of necessity be the purest, most transparent, and most highly refractive glass that can be prepared. Among various mixtures given by Donault-Wieland as suitable for strass the following is an example:—powdered quartz 300 parts, red lead 470, potash (purified by alcohol) 163, borax 22, and white arsenic 1 part, by weight. Special precautions are adopted in the melting of the materials, and the finished colorless glass is used for imitating diamonds. When employed to imitate colored precious stones the strass is melted up with various metallic oxides, to which reference will be made under colored glass. Artificial precious stones are, of course, easily distinguished from real stones by their inferior hardness, and by chemical tests. They may also be generally detected by a comparatively soft warm sensation they communicate when applied to the tongue.

Glass Tubes, used for gauge glass for steam boilers and for many other purposes, are made by a very simple process; but as the manufacture is a separate department of industry it demands some notice. A gathering of glass is made on a blow-pipe, which is marvered, and slightly blown, so as to form a thick-walled elongated globe. To the end of this globe opposite the blowing pipe a pontil-rod is attached by an assistant, and the two workmen move backward the one from the other, drawing out the tube as they recede. One or two boys watch the process of elongation, and when the tube reaches the desired gauge they fan its surface so as to "set" the glass, and thus prevent further attenuation at that particular point. The relation of the mass of metal to the original cavity determines the comparative stoutness and bore or internal diameter of the tube, and it requires much dexterity to make a tube at once straight and of uniform gauge and diameter. In drawing out tubes of large gauge the operatives recede from each other at a slow rate; and in proportion as the size of tube decreases the rate of drawing out increases. In the Venetian factories, where small tubes for beads are made, the workmen move at a smart walking pace.

Massive Glass.—Under this term may be conveniently noticed the manufacture of various familiar solid glass objects which do not acquire their form either by blowing or pressing in the ordinary sense.

Glass Rods form the basis of many of these objects; and the formation of a plain rod of glass is accomplished by a manipulation in all respects similar to that described under the head of glass tubes, the only difference being that the rod is drawn from a solid instead of from a hollow or blown gathering as in the case

with tube drawing. From solid rod glass, glass buttons of various forms are "pinched" by heating the rod till it softens, and immediately pinching it in heated molds made and worked like ordinary pincers, but having molds of suitable form in place of the gripping surface of the pincers. The small facets of glass lustres and grandolles and glass marbles, are made by an analogous process.

Spun Glass.—Certain qualities of glass in the plastic condition are capable of being drawn out to threads of great tenuity, which, while possessing much brilliancy and beauty of color, are perfectly flexible and elastic, and feel to the touch soft and smooth like fine wool. The material is specially useful in military ornaments owing to the fine colors in which it may be produced, and to the fact that it is unalterable in and unaffected by all kinds of weather.

A remarkable and novel application of glass was patented in 1878. It consists in making glass a cementing or binding substance in the manufacture of emery wheels, now so much used instead of files. For preparing the wheels any broken fragments of glass are utilized. These are reduced to powder, mixed with proportions of powdered flints and emery, and in the form of a cake introduced on a layer of paper into a furnace where the material is submitted to a heat sufficient to fuse it into a compact ringing mass. The resulting cake is of intense hardness and durability, and cuts through ordinary emery wheels with ease.

Colored Glass.—When to the ordinary materials in the melting pot small quantities of various metallic oxides and other mineral substances are added, colored but still transparent glass is produced. The colors yielded vary in intensity according to the proportion of oxides used; and the temperature at which the fusion is effected, the length of time the molten glass remains in the melting pot, not only modify, but actually change altogether, the resulting color.

Glass Painting.—The manufacture of colored glass, which is the basis of the beautiful and interesting art of glass painting, originated at a period of remote antiquity, and the use of enamels, to vary or ornament its surface, was known to the ancient Egyptians; but the formation of windows of mosaics of colored glass upon which the shapes of figures and ornaments are painted with an enamel fixed by fire is mediæval, and emphatically a Christian art. In all probability it was suggested by the mosaic pictures with which churches were adorned from an early period for the instruction of the illiterate, as was shown by the inscription which they bore, "sanctæ plebi Dei." The step from mosaic pictures to glass mosaic windows was merely a question of time; it is not known when the step was taken, but colored windows existed in St. Sophia in Constantinople in the sixth century, while the basilicas of St. John Lateran and of St. Peter at Rome were adorned about the same time in the same manner. In the year 709 Wilfrid, bishop of York, invited workers in glass from France ("artifices lapidearum et vitrearum fenestrarum primus in Angliam ascivit"). The French claim the honor of having invented the process of painting upon the mosaic windows of colored glass, and of thus transforming them into works of art, and also of teaching this to the English, who in their turn instructed the Germans; but Muratori in the second volume of his *Antichità Italiane* of the Middle Ages, printed a treatise on mosaic and painted glass written by an anonymous Italian in the eighth century, and probably not later than the eleventh was written the interesting essay *Diversarum Artium Schedula Theophili Presbyteri et Monachi*, which details with minute accuracy the process of painted glass as it has been practiced with some

additions and modifications, throughout the best periods of the art; it may reasonably be assumed that Theophilus describes methods invented before his time. Probably the oldest specimen of glass painting now existing is a window of the eleventh century in a church at Neuwiller, in Alsace, representing St. Timothy. The figure is rudely designed, but, with the rich border of ornament, shows that the executant knew his art, which in the following century is further illustrated by windows in St. Denis, near Paris, erected by the Abbé Suger, which are still preserved. It was, however, in the thirteenth century, that great age of the revival of art, that glass painting attained its first great development, and notwithstanding the claims advanced by France, it is most probable that as all art radiated from Italy as a general center of invention and progress, as well as of faith and dogma, so glass painting partook of the general impulse. Considered as a branch of fine art, Italian painted glass occupied a very high position at all periods of its history, for the designs were frequently made by some of the most famous of that long roll of immortal artists who have had so few equals elsewhere. In Germany the family of Hirschvogel of Nuremberg and other eminent artists, including, it is popularly believed, Albert Dürer, and in France Jean Cousin, Bernard Palissy, Louis Fauconnier, and others, equaled the Italian glass-painters, while both German and French artists excelled them in technical processes.

Besides being classified by centuries, Italian glass painting may be appropriately arranged under the following heads or schools:—the Pisan, Florentine, Sienese, Umbrian, Lucchese, Bolognese, Lombard, and Venetian; for notwithstanding the lamentable destruction of painted glass in Italy even now in progress, specimens by artists belonging to these schools still exist, and the names of a numerous array of glass-painters of these provinces are preserved. The best examples extant of this art in Italy of the first half of the thirteenth century are two couplets in the apse of the famous basilica of St. Francis at Assisi. In general arrangement and design they resemble windows of the same age in other parts of Europe classed by Mr. Winston under the general head of Early English, being divided into panels of varied and admirably designed geometrical forms surrounded by diapers and borders of rich fancy and glowing color, which, however, are rather more confused than similar details in contemporary glass elsewhere. The panels are filled with scripture subjects, and Italian skill and refinement are obvious in the design of the figures; this may be readily understood when it is considered that Italian artists of this time rendered the Greek art, universally followed, with more sentiment and power than any other people. The ornament shows the influence of Byzantine conventions, but the ornamentists imitated natural forms of foliage sooner than northern artists. A remarkable peculiarity of the early painted windows at Assisi, which are here taken as the best and almost the only specimens of thirteenth century glass left in Italy, is that throughout the couplets the backgrounds in each light differ in color. The subjects for instance in the right light are on a blue ground, on the left on a red ground, in other examples the grounds are alternately blue and green. It might be supposed that all unity of effect must have been destroyed in this way; but such is the skill with which the general harmony of color is arranged, that the counter-changes are less objectionable than might appear possible. Early Italian glass painting, like that of other parts of Europe, is characterized by an obvious ignorance of perspective on the part of the designers, but there are manifest indica-

tions of attempts to represent retreating surfaces and lines; that these have not the effect intended was not due, as some suppose, to the maintenance of a principle appropriate to glass painting, but simply to a want of knowledge of perspective laws common to all, even the greatest artists of the time.

In the next great age of art, that which commences with the triumphs of the genius of Giotto, glass painting evidently shared in the general progress.

Throughout the whole of the painted windows existing in Florence, of the fully developed style of the fourteenth century, and for a considerable portion of the fifteenth, the influence of the architectural design of Giotto and Orcagna is very perceptible. The color is especially noteworthy; the canopy, somewhat squat in form, is adorned in every part with rich and diversified colors evidently imitative of the varied marbles and the infinity of marble inlay and mosaics, characteristic of so much of the mediæval architecture of Italy; while in northern countries the canopies in windows, with their beautiful details of form showing such rich fancy and such graceful lines, are chiefly white, not that they are altogether colorless, for it is of the perfection of mediæval architecture to associate color with form.

In the history of painting glass in Italy during the fifteenth century, the windows of the cathedral of Florence, dating from 1390 to 1503, occupy an important position, not only by reason of their interest as connected with that celebrated church, but also because they were designed and executed by artists of highest reputation. The cathedral was founded September 8, 1298, the architect being Arnolfo di Cambio di Colle di Valdelsa. In 1334 Maestro Giotto was architect, and commenced the famous belfry. In 1364 the church was vaulted over at its eastern end, and, in 1420, Filippo Brunelleschi and Lorenzo Ghiberti, who built the clerestory of the nave, with its round windows and Renaissance cornice, were appointed joint architects. Painted glass was introduced into the windows thirty-six years before the completion of the cupola, and thirty before that of the clerestory. These dates are an interesting testimony to the importance attached at the time to painted windows as portions of the design of so great a church. They were erected in the aisles, before the nave was finished, by Don Lionardo di Simone, monk of Vallombrosa, and Niccolò di Pietro della Magna, so early as 1390, and, when the nave was roofed over by its architects, Fra Bernardino di Stefano executed the two first windows of the clerestory from designs by Lorenzo Ghiberti. Ghiberti is also alleged to have designed many of the painted windows at the east end of the church; but those now existing, judging by the design and color, as well as by the technical execution, cannot be his, for they are manifestly of earlier date, while the authorship of some of them is recorded in the archives without reference to Ghiberti. One only, on the north side of the apse and in the lower row, suggests the design of this great artist, the suggestion being strengthened by the fact that the diapered ornament on the ruby dress of the figure is made by the wheel, which brings this window within the fifteenth century, while the diapers in the other figures of the same series are executed in an older style. It has been stated that Ghiberti advised the municipality of Florence to invite a celebrated glass-painter of Lübeck, Francesco di Domenico Lievi da Gambassi, by letters, the second being dated October 15, 1436, to settle in Florence with special privileges; he came, and it is assumed that he painted Ghiberti's designs for glass, but of this there seems to be no satisfactory evidence. We find that in 1434, before his arrival, Maestro Domenico di Pisa painted the east window of the drum, representing the coronation of the Virgin, which was designed by Donatello in competition

with Ghiberti, and preferred. As it was on January 12, 1434, that Brunelleschi completed the dome, evidently no time was lost in commencing the painted windows. Bernardo di Francesco del Boni is recorded in the archives as having executed, in 1442, the following windows in the drum, called in Italian the tribune: The Resurrection, designed by Paolo Uccello, and the Ascension and the Prayer in the Garden, by Lorenzo Ghiberti, although by this time Francesco di Lievi da Gambassi had been some time in Florence. Bernardo del Boni is also recorded to have painted the Annunciation, designed by Uccello, removed some years ago, and the Ascension, described as being either by Ghiberti or Uccello; the uncertainty is curious. In 1448 the same artist painted the Presentation in the Temple, which was designed by Ghiberti. What windows, then, did the artist from Lübeck really execute? Born an Italian, he was instructed from his youth in Germany, and it is reasonable to suppose that his style would be German. Now, several of the upper windows of the transepts contain figures which have a decided affinity with German ideas, and it is not unreasonable to suppose that these were by the newcomer. He established furnaces by special permission, and it has therefore been hastily assumed that he manufactured colored glass; but these no doubt were to burn his painted glass.

Among the most active and able glass-painters of the prolific fifteenth century in Italy the Gesuati monks, whose convent was close to Florence and was razed to the ground during the siege when Michelangelo aided in the defense of the city, were celebrated. They prepared colors for artists, supplying Michelangelo when he painted the Last Judgment, and they executed numerous windows of which there are records from 1467 to 1562.

A glass-painter was now to make his appearance in Italy who was destined, although a foreigner, to eclipse in the opinion of the Italians all previous masters of the art; this was Fra Guglielmo di Marsillat, born in the diocese of Verdun in 1475. It is not known under whom he studied glass-painting, but for protection from the consequences of some escapade he entered the Dominican order. Claude, an eminent French glass-painter, being summoned to Rome by Julius II. to decorate the Vatican with painted windows, induced Marsillat to accompany him. Of the numerous windows which they must have painted only two remain in the church of Santa Maria del Popolo, so complete has been the destruction of painted windows in the Eternal City. Marsillat executed a number of magnificent windows in his manner for the cathedral of Arezzo. Marsillat, who painted well in oil and fresco, was the designer of his own windows. He was so impressed by the works of Michelangelo that he imitated his manner, and one of his windows at Arezzo, representing the *Raising of Lazarus*, is almost a transcript of the picture of the same subject designed by Michelangelo, and painted by Sebastian del Piombo, which is now in the National Gallery, London. The design of the Frenchman is rather more crowded, but is characterized by more life and action. He introduced into glass-painting the magnificent architectural backgrounds, with figures on balconies and terraces, made familiar by the works of Paul Veronese; he drew the human figure admirably, and was very successful in the representation of motion, and his arrangement of color was perfect in harmony. It is not to be wondered at that his works produced so great an effect upon the minds of his contemporaries.

Without entering upon the description of a considerable number of interesting works of glass painting in various parts of Italy, and of detailed notices of the art-

ists, enough has been done to illustrate the history and progress of the art from the thirteenth century to nearly the first half of the sixteenth. Later much less colored glass came to be used, and a considerable change in taste took place in this art as in architecture.

The technical execution of the glass paintings still existing in Italy resembles that prevalent elsewhere, and the method of the old masters is clearly described by Theophilus. The glass used was either pot metal or coated; that is, the color either pervades the whole body of the metal or is applied as a film over white glass, invariably the case with ruby, which would seem black but for this contrivance. The artist employed to design a window prepared a full-size working drawing, which, according to Theophilus, was executed on a whitewashed board in his time; but later these were made on paper. Guided by the firmly marked outlines, the glazier cut his mosaic of glass of the requisite colors by the aid of a hot iron, the diamond not being used for this purpose till the seventeenth century. The pieces of glass were further reduced to the shapes and sizes needed by the aid of the grozing iron, still a familiar instrument; thus prepared they were ready for the painter, and at the present time are attached to a transparent casel formed of a large sheet of glass. Theophilus thus describes the enamel color prepared for painting with:—"Take copper beaten small, burn it in a little pipkin until it is entirely pulverized, then take pieces of green glass and sapphire" (a blue paste used in mosaic work), "and pound them separately between two porphyry stones; mix these ingredients together in the proportions of one-third powder, one-third green glass, and one-third sapphire. Grind them on the same stone with wine or urine, put them into an iron or leaden vessel, and paint the glass with the utmost care. For with the three colors" (that is, shades of one color), "if you are diligent in the work, you can make the lights and shadows of the draperies in the same manner as in colored painting. When you have laid on the first touches in the drapery with the aforesaid color, spread it in such a manner that the glass may be pure" (that is, untouched) "in that part which you are accustomed to make light in a picture, and let the touches be dark in one place and light in another" (that is, graduated), "and again yet lighter and distinguished with much care, that it may appear as if three shades of color had been applied. This order you should observe below the eyebrows, and round the eyes, and nostrils, and chin, round the naked feet and hands, and other portions of the naked body; and thus let the glass painting have the appearance of a painting composed of many colors." It must be obvious from this description of the most ancient method of glass painting, in important respects the same as that still followed, that the art is regulated by certain necessary conventions distinguishing it from painting upon opaque surfaces. The features and accessories are drawn with sharp black lines making them out clearly to be seen at a distance, and in a very different way from the representation of such details in a picture. The highest lights are the local color, that is, the pure color of the glass; the deepest shadows are solid black produced by laying on the enamel thickly; all this is precisely the reverse of the system pursued at the same early period in painting pictures in which the shadows were the local color and the lights white. As painting advanced it gradually approached more nearly to the scale of color of the glass-painter, the lights instead of being white were painted of appropriate shades of the local color, and the shadows were graduated into black in their deepest parts. It may have been that glass painting suggested this important change in ideas of color and chiaroscuro. The glass being painted as described

must be burnt to fix the enamel thereon with its flux. The separate pieces with the painted side upward are placed upon the shelves of a kiln or iron box, covered with whiting; the kiln is placed in a brick oven, and a fire kindled which surrounds it with flames. Much experience is needed to determine when the glass is sufficiently burnt to fix the enamel. When this has been done the fire is withdrawn, the oven is hermetically sealed, and the glass is left to cool gradually, so as to be annealed. From the appearance of many Italian windows as compared with those executed elsewhere, it is reasonable to infer that the Italians were less skillful than their northern contemporaries in firing their glass. The next process is to unite the numerous pieces of mosaic, thus painted and burnt, into panels of a given size, which is done by means of ribbons of lead grooved on both sides, the ribbons being soldered at all their angles, thus firmly tying the mosaic together. When the painted window is erected, the leads are seen internally in contrast with the transparent glass as intensely black lines, but externally, where they catch the light, as meandering lines of metal dividing the surface. Mistaken attempts have repeatedly been made to get rid of these lines, but they are constituent parts of the art, can only be got rid of by changing its true character, and are only disfiguring when injudiciously introduced, as for instance in some fourteenth-century glass in Santa Croce, in which the whites of the eyes are fixed with leads of the form of spectacles, so that all the saintly persons represented appear, ridiculously enough, to wear these aids to defective vision. The panels, which are technically called glazing panels, are inserted in their places in the windows by means of grooves prepared in the stonework, into which they are secured with cement and strengthened at intervals with cross-bars of iron called saddle-bars, to which the glass is made fast by ties of copper wire. Thus fixed, experience has shown that painted windows if duly cared for will last for many centuries. Regarded in their connection with past history, no monuments of art surpass painted windows in interest; they are only equaled by the paintings still extant in the tombs of the Egyptians as illustrations of faith, history, and customs. It was almost the universal usage that persons of every rank and position, as well as corporate bodies and guilds, made offerings of painted windows to churches.

While they give the most vivid ideas of ancient taste and methods of decoration, the religious opinions of successive ages are interpreted by the manner in which sacred subjects are selected or represented; the actual state of art at different times, from its rudest forms to the most perfect, is admirably exemplified; and, as it was customary to introduce the donors in appropriate parts of their gifts, the prince or noble in knightly panoply, with his armorials, is seen kneeling, sometimes accompanied by his spouse.

GLASSCHORD, a musical instrument, with keys like a pianoforte, but with bars of glass instead of strings of wire. It was invented in Paris, in 1785, by a German called Beyer. The name glasschord was given to the instrument by Franklin.

GLASSIUS, SOLOMON (1593-1656), theologian and Biblical critic, was born at Sondershausen, in the principality of Schwarzburg-Sondershausen.

GLASS-PAPER, or **CLOTH**, is made by powdering glass more or less finely, and sprinkling it over paper or calico still wet with a coat of thin glue; the powdered glass adheres as it dries. Glass-paper is extensively employed as a means for polishing metal and wood-work.

GLASS SNAKE (*Ophisaurus*), a genus of lizards, belonging to the sub-order *Brevilingua*, family *Phrynosauridae* (*Zonuridae*), and allied to the *Scincidae*.

There is only one known species, common in the United States; it is serpent-like in form, over three feet long, and is entirely destitute of limbs. The body and tail are marked with transverse lines of black, green, and yellow. It feeds on insects, mollusks, etc., and can neither climb nor swim. It is remarkable for the readiness with which the joints of the tail break off upon any irritation, the joints thrown off being soon reproduced. The caudal muscles do not pass from one joint to another, so that the breaking of the tail involves no rupture of muscular fibers, but only a separation of one muscular plate from another.

GLASTONBURY, a market town and municipal borough in England, is situated near the middle of Somersetshire, about twenty-two miles southwest of Bath, on the great western road from London to Exeter. The abbey of Glastonbury is without doubt one of the very earliest ecclesiastical foundations in England.

GLASSWORT (*Salicornia*), a genus of plants of the natural order *Chenopodiaceae*, having uniform hermaphrodite flowers. One species (*S. herbacea*), a leafless plant with jointed stems, is common in salt marshes. It makes a good pickle, and is sometimes sold for this purpose. Several species grow abundantly on the shores of the Mediterranean; and as they contain a large quantity of soda, are used in making barilla, along with the species of saltwort.

GLATZ (Slav. *Kaldsko*), a fortified town of Prussian Silesia, chief town of a countship in the government district of Breslau. Population, 18,585.

GLAUBER, JOHANN RUDOLPH, alchemist and medicinal chemist, was born at Carlstadt in 1603, and died at Amsterdam in 1668.

GLAUBER'S SALT, the popular term for neutral sulphate of sodium, discovered by the chemist whose name it bears, and formerly known as "sal mirabile Glauberi." It occurs in nature in combination with calcium sulphate as the mineral glauberite, and uncommon in right rhombic prisms, as thenardite, being found in this form in Bolivia and Peru, and near Madrid; or in monoclinic prisms, with ten molecules of water as glauberite or ordinary Glauber's salt, in Austria, Hungary, Italy, and in great quantity as a deposit from the hot springs of Carlsbad. In medicine it is employed as a purgative.

GLAUCHAU, one of the most important manufacturing towns of Saxony, circle of Zwickau, is situated on the right bank of the Mulde, seven miles north of Zwickau and seventeen west of Chemnitz. While the population in 1834 was only 6,292, it was 14,357 in 1858 and 25,679 in 1900.

GLAUCUS (*Γλαυκός*, i.e., *γλαυκός*, "silvery" or "sheeny"), in Greek mythology, the name of several figures, the most important of which are the four described below:—

(1) **GLAUCUS**, surnamed Pontius (*ὁ πόντιος*, equivalent to *θαλάσσιος*), according to the common legend has originally been an expert fisherman and diver at Anhedon (Bœotia), but having eaten of the magical herb sown by Cronos, had leaped into the sea, where ultimately he was changed into a god, and endowed with the gift of unerring prophecy. He is generally represented as endowed with most of the attributes of Nereus, but occasionally he is identified with Melicertes. He is sometimes said to have instructed Apollo in prophecy. In art he is depicted as a vigorous old man with long hair and beard, his body terminating in a scaly tail. The *Argonautica* represent Glaucus as having been builder and steersman of the "Argo," as having alone remained unhurt in the fight of Jason with the Tyrrhenians, and as having afterward become a sea god, in which capacity he was able in various ways to assist the expedition.

(2) GLAUCUS, usually surnamed Potnieus (*ὀπυνεύς*), from Potniæ near Thebes, a deity worshiped chiefly in Corinth, is to be carefully distinguished from Glaucus Pontius. He was the son of Sisyphus by Merope, and the father of Bellerophon. According to the legend he was destroyed by his own mares,—the most common form of the story being that he was torn to pieces by them. Accounts differ as to the place of his violent death, and also as to the immediate occasion of it. He is most frequently represented as having offended Aphrodite by having kept his mares from breeding; but other versions of the myth are [that he had fed them on human flesh to make them more spirited, or they had been suffered to drink at a sacred well at Bœotia, or that they had eaten the herb hippocamenes. His affinities with Poseidon Hippius are obvious; and it may be taken for granted that the frantic horses of Glaucus Potnieus represent the stormy waves of the sea, just as Glaucus Pontius is himself a personification of the ocean in its friendlier and calmer moods.

(3) GLAUCUS, the son of Minos by Pasiphaë, when a child, playing at ball or pursuing a mouse, fell into a honey pot and was smothered. His father, after a vain search for him, consulted the oracle, and was referred for an answer to the person who should suggest the aptest comparison for one of the cows of Minos which had the power of assuming three different colors. Polyidus (*Πολύιδος*) of Argos, who had likened it to a mulberry (or bramble), which changes from white to red and then to black, soon afterward discovered the child. Minos then desired him to restore young Glaucus to life; and on his failure in this, he was sentenced to be entombed alive along with the corpse. Having in the sepulcher killed a serpent by which he had been attacked, he saw its companion revivify it by laying upon it a few leaves of a certain herb. The same herb he successfully applied to Glaucus. This curious myth is now very generally admitted to be of a solar character; but interpreters are far from unanimous as to the significance of the various details.

(4) GLAUCUS, son of Hippolochus, and grandson of Bellerophon, mythical progenitor of the kings of Ionia, was a Lycian prince who, along with his brother Sarpedon, assisted Priam in the Trojan war. The incident between Glaucus and Diomedes, as related in the *Iliad*, is well known.

GLEBE, in ecclesiastical law, is the land devoted to the maintenance of the incumbent of a church.

GLEE is a musical term for a part song of a particular kind. The word as well as the thing, are essentially confined to England. The technical meaning has been explained in different ways; but there is little doubt of its derivation from the Anglo-Saxon "gleov, gleo," delight, and hence *hudus musicus*. As to the word "glee," there are early examples of its being used as synonymous with harmony or concerted music. Glee in its present meaning signifies, broadly speaking, a piece of concerted vocal music, generally unaccompanied, and for male voices, though exceptions are found to the last two restrictions. The number of voices ought not to be less than three. As regards musical form, the glee is little distinguished from the catch,—the two terms being often used indiscriminately for the same song; but there is a distinct difference between it and the madrigal—one of the earliest forms of concerted music known in England.

The convivial character of the glee led in the last century to the formation of various societies, which offered prizes and medals for the best compositions of the kind, and assembled for social and artistic purposes.

The most famous among these—the Glee Club—was founded in 1783, and at first used to meet at the

house of Mr. R. Smith, in St. Paul's Churchyard. This club was dissolved in 1857. A similar society—the Catch Club—was formed in 1761, and is still in existence.

GLEIG, GEORGE, bishop of Brechin, Scotland, was the son of a farmer, and was born at Boghall, Kincardineshire, May 12, 1753. He died at Sterling in February, 1839.

GLEIM, JOHANN WILHELM LUDWIG, a minor German poet, was born April 2, 1719, near Halberstadt, and died there February 18, 1803, after having occupied during half a century the situation of secretary to the chapter of Halberstadt. "Father Gleim" was the title accorded to him throughout all literary Germany on account of his kind-hearted though inconsiderate and indiscriminating patronage alike of the poets and poetasters of the period.

GLEIWITZ, a town in the Prussian province of Silesia, chief town of the circle of Tost-Gleiwitz, government district of Oppeln, is situated on the Klodnitz, and on the railway between Oppeln and Cracow. The population in 1900 was 52,372.

GLENDOWER, or GLYNDWR OWEN, the last native who assumed the title of the Prince of Wales, and the leader of the only formidable attempt made by the Welsh to regain their freedom, after they had been subjugated by Edward I., was born most probably at Glyndwr in Montgomeryshire, whence his name, about the year 1354. He found his way to the English court, where he became a favorite with King Richard, and was made an esquire of his body. When Richard went to Ireland Owen accompanied him, as he did also on his return to Wales. He was present when Richard placed himself in the hands of the treacherous Northumberland, and at Flint, where his disposition was decided upon. Owen thereupon retired into private life. He had the misfortune to have for a neighbor Reginald de Grey, earl of Ruthin; and between him and De Grey a feud existed, occasioned by a dispute about a piece of waste land. In the time of Richard, Owen was successful in a lawsuit; but no sooner was the king deposed than De Grey took forcible possession of the land. Owen in vain appealed to parliament, although the bishop of St. Asaph entreated them to grant his request, and warned them that, if they did not, Wales would rise in rebellion; and a little later Henry IV., on the ground that Owen, as a crown tenant, had neglected to join an expedition to Scotland (while the fact was that the summons, which had been intrusted to De Grey to give to Owen, was not delivered until it was too late) declared a forfeiture of his land held by the crown, and granted some of it to De Grey. With armed retainers De Grey took possession; but Owen mustered his followers, and after regaining his own, devastated the lands of De Grey. Henry took De Grey's part, and Owen set both at defiance. On September 20, 1400, Owen struck the first blow for the freedom of his country at Ruthin, where a fair was being held. At a parliament held at Machynlleth, at the close of this year (1402), Owen was formally proclaimed Prince of Wales. For years he carried on a desultory warfare, but defections from his ranks so weakened his power that he was no longer the dangerous enemy that he had been. But he never submitted. In July, 1415—fifteen years after the first outbreak—the king, now Henry V., authorized Sir Gilbert Talbot to treat with Owen, and to offer him and his followers free pardon, "in case they should desire it." A similar offer was made in February, 1416. His death is believed to have taken place at the house of one of his daughters in Monmouthshire, but there is no certainty as to either the date or the place of his death.

GLENS FALLS, a town of Warren County, N. Y., on the Hudson river, with a population of (1900) 12,613. It takes its name from the falls of the river (50 feet high). It has ample railroad, bank and telegraph facilities, and some manufactures. It is steadily growing in population and commercial importance.

GLEYSRE, MARC CHARLES GABRIEL, a celebrated French painter, was of Swiss origin, having been born at Chevilly in the canton of Vaud, May 2, 1806. Mention is made of two decorative panels—*Diana Leaving the Bath*, and a *Young Nubian*—as almost the first fruits of his genius; but these did not attract public attention till long after, and the painting by which he practically opened his artistic career was the *Apocalyptic Vision of St. John*, sent to the Salon of 1840. This was followed in 1843 by *Evening*. After 1845, when he exhibited the *Separation of the Apostles*, he contributed nothing to the Salon except the *Dance of the Bacchantes*, in 1849. And yet he labored steadily and was abundantly productive. A long series of years intervened between the first conception of a piece and its embodiment, and years not unfrequently between the first and the final stage of the embodiment itself. It was while on a visit to the Retrospective Exhibition, opened on behalf of the exiles from Alsace and Lorraine, that he suddenly dropped down and expired May 5, 1874. He left unfinished the *Earthly Paradise*, a noble picture.

GLINKA, FEDOR NIKOLAEVICH, a Russian poet and author, was born at Smolensk in 1788, and died on his estates in 1849.

GLINKA, MICHAEL IVANOVICH, a celebrated Russian composer, was born at Novospassky, a village in the Smolensk government, in 1804. His training as a composer was finished under Dehn, the celebrated contrapuntist, with whom Glinka staid for several months at Berlin. He wrote and arranged several pieces for the orchestra, among which the so-called *Kamarinskaya* has achieved popularity beyond the limits of Russia. He also composed numerous songs and romances. In 1857 he went abroad for the third time, and died suddenly at Berlin, on February 14th of that year.

GLINKA, SERGY NIKOLAEVICH, Russian author, the elder brother of Fedor N. Glinka (noticed above), was born at Smolensk, in 1774, and died in 1847.

GLOBE. With the exception of illuminated portulani, the most interesting monuments of geography are globes. Celestial globes are much more ancient than terrestrial ones. The earliest of these with which we are acquainted is one made of copper engraved in the Arab-Cufic character of the eleventh century. It is preserved in the Bibliothèque Nationale de Paris. In Italy the emperor Frederick II. (1197–1250) possessed a celestial globe of gold, probably also of Arab manufacture, on which the stars were indicated by pearls; from the scanty information that has come down to us respecting it we should imagine that it partook somewhat of the nature of an armillary sphere, as representations of the planets were to be seen in the interior of it. To these succeed a series of globes ranging from the fifteenth to the seventeenth century.

One might suppose that many specimens of these globes would exist in public libraries, but diligent research has shown that the majority of those not made of metal are more perishable than maps, and much more so than books. The earliest terrestrial globe of any importance known to geographers is the well known one of Martin Behaim of Nuremberg, bearing the date of 1492. As a monument of geography it is of the highest importance, being the only original document that has come down to us in this form embodying the geographical views of its author with those of his gifted

contemporaries, Toscanelli, Columbus, etc. This globe represents with some slight modifications most of the disproportions of the Ptolemaic geography, into which is incorporated information evidently derived from the travels of Marco Polo and Sir J. Maundeville. It was executed by Behaim, assisted by Holtzschuer, while on a visit to his native city (1491–3), after a sojourn of five years at the Azores. It is still preserved in the house of his ancestors at Nuremberg.

In all probability the earliest post-Columbian globe extant is the one now preserved in the Lenox Library, New York. It was found in Paris some twenty-five years ago by Mr. Richard M. Hunt, who, upon learning its value, presented it to the Lenox Library, of which he is the architect. This globe is of copper, about four and one half inches in diameter and engraved. It is pierced for an axis, and probably, like the Laon sphere, formed the principal feature of an astronomical clock or armillary sphere. The date assigned to the Lenox globe by Mr. Henry Stevens, who first recognized its importance, and had an accurately drawn projection made of it in the Coast Survey Bureau at Washington in 1869, is about 1506–7. A comparison of that projection, now published in reduced fac simile for the first time, with several contemporary maps and globes, serves to show the accuracy of the date assigned to it, as also to suggest its French origin. The author is unknown.

The next globe that demands attention is the famous one made at Bamberg in 1520 by Johann Schöner, at the cost and charges of his friend Johann Sayler. It was afterward taken to Nuremberg by Schöner, where it is still preserved in the town library. The importance attached to this globe is that hitherto it has always been regarded as the first of its kind to portray the discoveries in the New World, in combination with the notions that had previously prevailed of the space intervening between Europe and Africa on one side, and the eastern ends of Asia on the other. Schöner in this globe breaks up America into as many islands as possible. Thus North America is shown as one large island. He also represents South America as a large island, to which he applies several names, among which we observe, for the first time on a globe, the name "America." North America was not comprised under the name until a later date. Schöner's globe indicates two great series of North American discoveries of which one, commencing with the Cabots in 1497, extended by degrees to Canada and Nova Scotia, while the other, commencing with Columbus in 1492, advanced from the Bahamas slowly northward to Virginia and New England. Between these two points there remained a region more or less known which on this globe is indicated by open water. In depicting the east coast of Asia and the many islands there, including Japan and Java-major, the author follows the globe of Behaim. By some it has been regarded as a new edition of Behaim. There are in Germany several globes which depict the world nearly in the same manner as Schöner's. One, preserved in the city of Frankfurt, bearing the same date (1520), is about ten and one-half inches in diameter, and has been produced by M. Jomard in his *Monuments de la Géographie*, pl. 15 and 16. There is also another in the library of the grand-duke of Weimar. As all these globes give to North and South America the configuration they have in Schöner, Humboldt was of opinion that they all are, with respect to America, copies of an older chart "hidden perhaps in the archives of Italy or Spain."

There is at Nancy a terrestrial globe which is also a geographical curiosity. It is of chased silver gilt, about six inches in diameter; the land portion are represented in fine gilding, the water in azure blue enamel. One of the hemispheres opens outwardly

horizontally, the interior being also gilt. It formerly served the purpose of a pyx on the altar of the church of Notre-Dame-de-Sion, to which church it was offered by Charles IV., duke of Lorraine, on his return in 1663. It is now preserved in the town library.

In 1541 the illustrious Gerard Mercator constructed and published at Louvain a terrestrial globe, and in 1551 a champion celestial globe. These are without doubt the most important monuments of the kind of the sixteenth century. They were to be found in nearly all the universities and libraries of Europe, in the private libraries of the rich, and the class-room of the teacher of navigation. Yet only two sets of the original globes are known now to exist in Europe—one in the royal library at Brussels, discovered in 1868, the other in the imperial court library at Vienna, discovered in 1875. These globes are about two feet high, and when first mounted on stands with all their accessories, meridians, horizons, etc., must have presented a noble appearance. They are only known to us by facsimiles of gores reproduced from the originals in their natural size, published at Brussels in 1875, with an introduction to their history by Dr. J. Van Raemdonck. A comparison of the terrestrial globe with all those that preceded it shows it to be a monument at once of learning and science, worthy of the greatest scientific geographer of his age. The authors used by Mercator in his configurations of the continents of the Old World were chiefly Ptolemy and Marco Polo. For representing the New World he evidently acquainted himself with the narratives of all the most recent voyages, maps, and charts that were to be had in his time. These were used with the greatest possible skill and discrimination; and in consequence we have the best delineation of the world on a globe that it was possible to produce at the period. In Mercator's time the imperfect knowledge of pilots in general, and the defects of their charts in plano, made terrestrial globes much more useful to navigators than we can well realize to-day. Convinced of their importance Mercator neglected nothing in order to adapt them to the use of seamen; he therefore added to his globes the rhumbs hitherto found only on plain charts. He added yet another improvement, delineating about thirty leading stars of the principal constellations according to their magnitudes and their positions in the heavens. These important improvements appear to be quite peculiar to the globes of Mercator.

An examination of the celestial globe of 1551 also reveals many improvements introduced by Mercator in his delineation of the heavens. Without counting a great number of stars as yet unresolved into symbolical groups, Mercator gives us 934 fixed stars, distributed in fifty-one constellations. Two of the latter are entirely new, and are not met with on later celestial globes. These are Antinous, formed of six stars on the equator below the Eagle, and Cincinnus, or the Lock of Hair, formed of one star and two nebulae in the north hemisphere, under the tail of the Great Bear.

The Globe of Euphrosynus Ulpius of 1542.—This globe, apparently made in Rome, is now preserved in the museum of the New York Historical Society. It is fifteen and a half inches in diameter, made of copper, and is divided into two hemispheres on the line of the equator, and fastened together with iron pins. The normal position of the globe in its stand being vertical, the north pole with its hour-circle is surmounted by an iron cross. It is encompassed by a horizon, upon which are engraved the signs of the zodiac. The height of the whole apparatus, with its stand of oak, is three feet eight inches.

The true successor of Mercator in the art of globe-

making was not J. F. Van Langren, Jodocus Hondius, or W. J. Blaeu, as has been supposed, but an Englishman named Emeric Mollineux, the friend of Hakluyt, and of John Davis of Arctic fame. The "coming out of the very large and most exact terrestrial globe" of Mollineux there referred to, with its companion celestial one, was accomplished in 1592. At the same time appeared a manual in English for their use, by Thomas Hood of Trinity College, Cambridge; and in 1594 appeared another manual, written expressly for them in Latin by Robert Hues, entitled *Tractatus de Globis et eorum usu*. Two years afterward this latter was translated by J. Hondius, and published in Amsterdam, giving rise to the notion, apparently still prevalent in Holland, that Hues wrote this book expressly for Hondius—a bibliographical blunder involving injustice to the memory of Mollineux. The only examples of these once famous globes known to exist are now preserved in the library of the Middle Temple, London. They are both two feet in diameter, mounted on stands, with the usual accessories of horizon, meridian, etc. The celestial globe still bears the date of 1592, but the terrestrial appears to have received additions, and the date has been altered by the pen to 1603.

In the Academy of Sciences at St. Petersburg there are or were four globes that call for notice. The first is a terrestrial one, three feet in diameter, made at Pleskow by a deacon named Karpow Maximow. It is supposed to have been the first made in Russia. Here is also preserved a large terrestrial globe of copper, made in 1664 by the heirs of W. J. Blaeu; it is seven feet in diameter, and was brought from Moscow about 1747. In the same academy is preserved the famous Gottorp globe; it is a hollow sphere eleven feet in diameter, containing a table and seats for twelve persons. It was made by A. Bush in 1654, under the direction of Olearius, from designs found among the papers of Tycho Brahe, and was not finished until 1664.

The two largest complete globes existing are those preserved in the "Salle des Globes" in the Bibliothèque Nationale of Paris. They are each twelve feet in diameter, and were made under the direction of the famous Italian geographer Coronelli, in 1683, by order of Cardinal d'Estreé, the Spanish Ambassador, and presented by him to Louis XIV. They are made of wood, very solid, and are covered with cloth or canvas on which the configurations have been drawn by an able artist, particularly those on the celestial globe.

About 1764 Dr. Roger Long of Cambridge, professor of astronomy and master of Pembroke, erected in an outbuilding of his hall a sphere eighteen feet in diameter. The concave interior was lined with tin, upon which were depicted all the stars and constellations visible in England on the horizon of Cambridge. To these succeeded in order of size the globes known as "Georamas." One exhibited in Paris in 1844 was thirty feet in diameter; another by Delanhard, erected in 1823, was forty feet in diameter; of the last the proprietor published a description. Then follows Wyld's well-known "great globe," erected in Leicester Square, London, sixty feet in diameter. The largest appears to have been the one erected by Colonel Langlois in Paris in 1825, on the Champs Elysées. This was 120 feet in diameter. As has been truly said, these structures served more to satisfy curiosity than to impart scientific instruction.

The manufacture of artificial globes has changed but little in character during the last hundred years. Such improvements as have been introduced have reference either to the quality of the maps or to the mode of mounting the globes. The number of sizes manufactured has also been increased. The diameter has always

been used to indicate the size of the globes, and those now produced by the various makers vary from one to thirty-six inches.

The process of manufacture differs little if at all in the sizes of globes ranging between three and twenty-five inches. Thus supposing, for example, a twelve-inch globe (the ordinary school globe) is required to be made, a spherical mold measuring some quarter of an inch less in diameter, is prepared on which to form hemispherical caps that are to constitute a hollow foundation for the globe. This mold, made preferably hollow for lightness, and having a central axle terminating in poles, is well greased on the surface to enable it to resist damp. To form the caps, strips of white paper, damped in water, are first applied to the mold to form a coating thereon. Upon this coating is applied brown paper saturated with paste, and alternate layers of white and brown paper are added, until the required thickness of paper, say one-sixteenth of an inch, is obtained. The change of color is adopted simply as a guide to the workman, that he may know when he has completed a coating of paper. The mold thus covered is put aside to dry, and, after two or three days, the paper covering is severed into two hemispherical caps, which are then drawn off from the mold.

A wooden axle furnished with poles (which will eventually form the north and south poles of the globe) is of such a length as will enable the caps, when fitted over the poles, to meet at their severed edges. By means of glue these edges are joined up, and the caps are firmly attached to the ends of the axle. Thus a hollow sphere of rude outline is formed, measuring somewhat less than twelve inches in diameter. The next operation is to bring this sphere to the required diameter for the globe, and to make it perfectly true. For this purpose the ball is coated with a plastic composition of whiting, boiled oil, and glue, and passed under the action of a steel semicircle fitted with bearings for receiving the poles of the ball, and retaining the same in place while the ball is being slowly rotated. By applying to the ball repeated coatings of this composition, and removing all superfluities by means of the gauging edge of this steel semicircle, a smooth spherical surface is eventually obtained. When the ball is finished and hard, it is tested in loose bearings to see whether it will remain quiescent in all positions. If it shows a tendency to run round, the ball is balanced by the introduction of a counterweight at the highest part of its periphery. When the ball is balanced, and the hole made good by which the counterweight was introduced, the surface is polished, after which it is ready to receive the map. For twelve-inch globes the maps of the earth and of the heavens are engraved on steel or copper plates in twelve gores, measuring each thirty degrees in width, and extending from pole to pole, or more usually to the seventieth degree of latitude, the remaining portion of the maps being made up by north and south pole plates. This arrangement is somewhat modified for larger globes. Thus, for globes above fifteen inches in diameter, the gores are divided in the line of the equator, and they are also divided longitudinally for say one-fourth of their length at the fifteenth degree, in order to facilitate the laying down of the maps evenly upon the spherical surface. Preparatory to covering the sphere with the map; it is marked with lines corresponding to the equator, parallels of latitude, and lines of longitude on the map, such lines serving as a guide for the workman. The gores of the map having been carefully cut out, they are damped and laid down in proper order in a pile upon a pasting board. The workman then covers his polished ball, for the length and breadth of a gore, with paste, or, more properly, a preparation of starch, and having coated with

starch the uppermost gore of the pile, he with an ivory knife lifts that gore, and lays it upon the pasted portion of the ball, fitting it to the lines marked thereon, and smoothing down creases, at the same time taking care that the latitude and longitude lines of the gore correspond exactly with the lines on the ball. Having laid down this gore in place, he next applies a second gore in like manner, taking care that the two gores shall join each other, and not expose any portion of the underlying surface. In this way the workman proceeds until all the gores are in place, and he finishes the pasting of the ball by applying the pole papers which fit respectively on to the opposite ends of the gores. The map has next to be sized, preparatory to its being colored, in order to form a resist to the varnish which is subsequently to be applied to the globe. The map is tinted and outlined with water colors, and a coat of varnish is then applied. When this is dry the globe is ready for mounting; after which the varnishing operation is completed by the application in a heated room of several coats of spirit varnish following quickly the one on the other. Some skill is requisite in laying on the varnish, so as to obtain a surface as clear and smooth as glass. This result is unfortunately evanescent, as the best varnish is liable to discolor and to crack, and thereby obscure, to some extent, the legibility of the underlying map. After varnishing the globe will be fit to handle in from four to six days. For the purpose of mounting the globe, a flat ring, termed the brazen meridian, is provided, and bearings are formed thereon to receive the poles of the globe. This ring is divided on its face into 360 degrees, the numbering of these degrees being from 0 (which corresponds with the equator) to 90 at the poles on one half of the ring, and on the other half the numbering starts from the poles at 0, running up to 90, which corresponds with the equator. Fitted to the poles, and capable of turning thereon, are hour circles, which underlie the brazen meridian, and are divided and numbered to correspond with the twenty-four hours of the day and night. The frame for the reception of the globe and ring is formed with a wooden horizon, which constitutes an imaginary line dividing the globe into two equal parts, the portion above the horizon being the visible half, and that below the horizon the invisible half of the sphere. This horizon is covered, like the globe, with papers which are varnished to protect them from injury. The horizon papers near their inner edge are divided into 360 degrees, by which are reckoned the azimuth and the amplitude; they also indicate the points of the compass in the space called the circle of the winds. The horizon of the frame is notched to receive the brass meridian, which rests in a step-bearing fitted to the central pillar or block of the frame, and is held therein by a screw stop, which, entering an annular groove in the back of the meridian, leaves the ring free to turn round in the frame, for the purpose of rectifying the globe, or bringing its axis to any desired angle with the horizon. The fitting of the globe is completed by the quadrant of altitude, consisting of a thin flexible slip of brass, joined to a clamping nut, which is intended to embrace the brass meridian, and may be adjusted thereon by a tightening screw. This flexible slip or blade is divided off into ninety degrees, corresponding to those on the equator, and is intended to measure distances between any two places upon the curved surface of the earth, or the altitude of the sun, a star, or any planetary body in the heavens, and for this purpose its graduations are numbered from 0 to 90. A useful appendage to the globe frame is a mariner's compass, which facilitates the adjustment of the globes to their true solar position.

GLOBE-FISH or SEA-HEDGEHOG. By these names

some sea-fishes are known, which have the remarkable faculty of inflating their stomachs with air. They belong to the genera *Diodon* and *Tetodon*. Their jaws resemble the sharp beak of a parrot, the bones and teeth being coalesced into one mass with a sharp edge. In the *Diodonts* there is no mesial division of the jaws, while in the *Tetodonts* such a division exists, so that they appear to have two teeth above and below. By means of these jaws they are able to break off branches of corals, and to masticate other hard substances on which they feed. Usually they are of a short, thick, cylindrical shape, with powerful fins. Their body is covered with thick skin, without scales, but provided with variously formed spines, the size and extent of which vary in the different species. When they inflate their capacious stomachs with air, they assume a globular form, and the spines protrude, forming a more or less formidable defensive armor. A fish thus blown out turns over and floats belly upward, driving before the wind and waves. Many of these fishes are highly poisonous when eaten, and fatal accidents have occurred from this cause. It appears that they acquire poisonous qualities from their food, which frequently consists of decomposing or poisonous animal matter, such as would impart, and often does impart, similar deleterious qualities to other fish. They are most numerous between the tropics and in the seas contiguous to them, but a few species live in large rivers, as, for instance, the *Tetodon fahaka*, a fish well known to all travelers on the Nile. Nearly 100 different species are known.

GLOBIGERINA. See FORAMINIFERA.

GLOGAU (sometimes called Gross or Great Glogau, to distinguish it from Klein or Little Glogau, in the government of Oppeln) is a fortified town of Prussia at the head of a circle in the Lower Silesian government of Liegnitz, situated partly on an island and partly on the left bank of the Oder, about eighty miles southeast of Frankfort. Population (1901), about 25,000.

GLOSS, GLOSSOGRAPHER, GLOSSARY, GLOSSATOR.—The Greek word *γλῶσσα* (*glōssa*) meaning originally a tongue, hence a language or dialect, gradually came to denote especially any obsolete, foreign, provincial, technical, or otherwise peculiar word or use of a word; and the making of collections and explanations of such *γλῶσσαι* (*glōssai*) was at a comparatively early date a well-recognized form of literary activity. It was not, however, until the Alexandrian period that the *γλῶσσογράφοι* (*glossographoi*) became very numerous. Of many of these it is probable that even the names have perished; but in the writings of Athenæus alone (c. 250 A.D.) allusions are to be found to no fewer than thirty-five. Among the earliest may be mentioned Philetas of Cos (d. c. 290 B.C.), the elegiac poet. He was the compiler of a lexicographical work. Next came his disciple, Zenodotus, of Ephesus (c. 280 B.C.), one of the earliest of the Homeric critics, and the compiler of *Γλῶσσαι Ὀμηρικαί* (*Glōssai Homerikai*). Zenodotus in turn was succeeded by his greater pupil, Aristophanes, of Byzantium (c. 200 B.C.). From the school of Aristophanes issued more than one glossographer of name—Diodorus, Artemidorus, Nicander, of Colophon; and Aristarchus, the famous critic, whose numerous labors included an arrangement of the Homeric vocabulary in the order of the books. Contemporary with the last named was Crates, of Mallos, who, besides making some new contributions to Greek lexicography and dialectology, was the first to create at Rome a taste for similar investigations in connection with the Latin idioms. Coming down to the beginning of the first century of the Christian era, we find Apion, a grammarian and rhetorician at Rome, during the reigns of Tiberius and Claudius, following up the labors of

Aristarchus and other predecessors. Heliodorus, or Herodorus, was another almost contemporary glossographer; Erotian, also, during the reign of Nero, prepared a special glossary for the writings of Hippocrates, still preserved. In the following century one of the most prominent workers in this department of literature was Ælius Herodianus. To the fourth century belongs Ammonius, of Alexandria (c. 389), who wrote a dictionary of words used in senses different from those in which they had been employed by older and approved writers. Of somewhat later date is the well-known Hesychius, whose often-edited *Lexicon* rightly superseded all previous works of the kind; Cyril, the celebrated patriarch of Alexandria, also contributed somewhat to the advancement of glossography; the names of Orus and Orion, of Philoxenus, and of the two Phileons, also belong to this period. In Latin lexicology the most prominent name is that of Festus, whose only extant work, however, is but an epitome of the treatise of Verrius Flaccus *De Verborum Significatu*. This last-named author had himself been preceded by Varro, who in turn makes allusion to several before him. The introduction of grammatical and linguistic studies into Rome is usually attributed to Crates, of Mallos (c. 267 B.C.), mentioned above.

To a special category of technical glossaries belongs a large and important class of works relating to the law-compilations of Justinian. Although the emperor forbade, under severe penalties, all commentaries on his legislation, yet indices and references, as well as translations and paraphrases, were expressly permitted, and lavishly produced.

In Italy, also, during the period of the Byzantine ascendancy, various glossæ and scholia on the Justinian code were produced; particularly the Turin gloss, to which, apart from later additions, a date prior to 1090 is usually assigned. After the total extinction of the Byzantine authority in the West the study of law became one of the free arts, and numerous schools for its cultivation were instituted. Among the earliest of these was that of Bologna, where Pepo (1075) and Irnerius (1100–1118) began to give their expositions. They had a numerous following, who, besides delivering exegetical lectures, also wrote Glossæ, first interlinear, afterward marginal.

With the decay of learning and originality during the dark ages grew the necessity for making and the custom of transcribing on manuscript copies of the Vulgate various notes, explanatory or otherwise, of the text. Ultimately collections of these glosses or sets of glosses came to be made. They are distinguished as either marginal or interlinear. The most famous collection of *Glossæ marginales* was that made by Walafridus Strabus in the ninth century; it consists of notes grammatical, historical, and theological, culled from the writings of Augustine, Ambrose, Jerome, Gregory, Isidore, Bede, Aleuin, and Hrabanus Maurus, with additions by himself. The interlinear glosses (which as a rule were not so full as the marginal) were sometimes theological but more generally purely philological.

GLOSSOP, a municipal borough of Derbyshire, is situated on the extreme northern border of the county, fourteen miles east-southeast of Manchester. It is the chief seat of the cotton manufacture in Derbyshire, and it has also woolen and paper mills, dye and print works, and bleaching greens. Population, 25,574.

GLOUCESTER, a county in the west midland district of England, bounded on the north by Worcester and Warwick, on the south by Somerset, on the east by Oxford and Wilts, and on the west by Hereford and Monmouth. The river Wye forms the western boundary line, the Stratford Avon part of the northern, the

l'ristol Avon the southwestern, and the Thames for some miles the southeastern. The shape of the county is irregularly elliptical, its greatest length in direct line from Bristol to Clifford Chambers (northeast) being fifty-four miles, its greatest width from Down Ampney to Preston, near Ledbury, at right angles, thirty-three miles. The area, according to the tithe surveys—deducting 3,000 acres of detached land incorporated by an Act of 1844 with the counties of Worcester, Warwick, and Wilts, by which they were surrounded, and 17,688 acres of water—amounts to 805,102 acres, mostly cultivated. The county has three natural divisions, the hill, the vale, and the forest, parallel to each other north and south.

In the soil of the hill country is so much lime that a liberal supply of manure is required. This is provided by folding sheep and by paring and burning the turf and strewing the ashes on the surface. Good crops of barley and oats are thus obtained, and even of wheat, if the soil is mixed with clay. But the poorest land of the hill country affords excellent pasturage for sheep, the staple commodity of the district; and the sainfoin, which grows wild, yields abundantly under cultivation. The Coteswolds have been famous for the breed of sheep named from them since the early part of the fifteenth century—a breed hardy and prolific, with lambs that quickly put on fleece, and become attempered to the bracing cold of the hills, where vegetation is a month later than in the vale. Improved of late years by judicious crossing with the Leicester sheep, the modern Cotswold has attained high perfection of weight, shape, fleece and quality.

GLOUCESTER, the capital city of the county named after it, 106 miles from London by road and 114 by railway, derives its name from the British *Caer-Gloui*, near which a Kingsholm the Romans formed their camp of Glevum, vestiges of which remain in our principal streets running north, south, east and west, and crossing at the center, as well as in Roman pavements, altars, coins and pottery. A Roman station under Aulus Plautius, it became a city of Mercia, by name Glouancastre, under the Saxons, and is named by Bede as one of the noblest cities in the land. A monastery was founded here in 679, in which in 1022 Bishop Wulstan of Worcester established the Benedictine rule. In the eighth century the city was repeatedly ravaged and burnt by the Danish invaders, and endured ruinous conflicts up to the time of the settlement between Canute and Edmund Ironside. The abbey throne from the time of Canute, the foundations of the present church having been laid by Abbot Serlo (1072-1104), and Walter Frocester, its historian, becoming its first mitred abbot in 1381. Edward the Confessor often resided at Gloucester, and it was a favorite resort of the Norman kings, of whom Henry I. met his death from a surfeit of lampreys, for which he acquired a taste there. Henry II. held a great council there, and Henry III. was crowned in the abbey, and "loved Gloucester better than London." The "statutes of Gloucester" were passed in parliaments held there in succeeding reigns; but the tide of royal favor experienced an ebb when Charles I. subjected the city, garrisoned by the Parliamentarians, to a critical siege, which was eventually raised in September, 1643, by the earl of Essex. The cathedral may be succinctly described as "a Norman carcase," altered by additions in every style of Gothic architecture.

Gloucester is situated on a gentle eminence overlooking the Severn, and sheltered by the Coteswolds on the east, while the Malverns rise prominently to the west. The principal public buildings are the shire hall, the town hall or Tolsey (occupying the site of the ancient

Roman capitol), the county jail and penitentiary, the East-gate market, the corn market, the infirmary, the lunatic asylum, and the hospital erected in 1861 in place of the four old almshouses. There are fourteen churches and several dissenting chapels, and it may have been the olden proverb, "as sure as God's in Gloucester," which provoked Oliver Cromwell to declare that the city had "more churches than godliness." The city was chartered by Richard III., and is now governed by a mayor, six aldermen and eighteen burgesses. Its ancient industries were iron-founding, cloth-making, pin-making and bell-founding, but the last two have been for some time discontinued. It now possesses iron and brass foundries, marble and slate works, chemical works, soap works, rope works, flour mills, manufactories of engines, machines and agricultural instruments, and boat and ship-building yards. The population of the administrative county in 1901 was 331,516; that of the municipal borough in 1871 was 18,330, and of the parliamentary borough in 1901 was 47,943.

GLOUCESTER, a city and port of entry of Essex county, Mass., is beautifully situated near the southern extremity of the peninsula of Cape Ann, thirty miles north-northeast of Boston by rail. It includes six villages—Gloucester village, East Gloucester, West Gloucester, Annisquam, Bay View, and Lanesville. The harbor, opening out into Massachusetts bay, is one of the best on the coast, and is defended by a fort. The prosperity of Gloucester depends mainly on its cod and mackerel fisheries. Steamers ply daily between the city and Boston. There are a number of manufactories connected chiefly with the fisheries, and in the neighborhood there are extensive granite quarries. Gloucester possesses a fine city hall, a high school, grammar schools, and a free library. On account of its attractive situation, and the fine scenery of the neighborhood, it is a favorite summer residence. About two miles from it is Norman's Woe, the scene of the wreck of the *Hesperus*, celebrated in Longfellow's poem. Population (1900), 26,121.

GLOUCESTER, a banking, railroad and telegraph town of Camden county, N. J. It has of late years had a steady growth, both in population and commercial interest. Present population (1900 census), 6,840.

GLOUCESTER POINT, the extreme point of Gloucester county, Va., opposite Yorktown, notable as the scene of important military operations during the siege of Yorktown (where Cornwallis surrendered, ending the Revolutionary War) and also during the advance made against Richmond by General McClellan in the late Civil War. The nearest banking town is Richmond.

GLOUCESTER, ROBERT OF. See ROBERT OF GLOUCESTER.

GLOVE (Saxon *glof*), a covering for the hand, with a separate sheath for each finger. Among our ancestors, to throw down the glove or gauntlet was equivalent to a challenge to single combat, and the person thus defied signified his acceptance of the challenge by taking up the glove, and casting down his own—which ceremony was regarded as a mutual compact to meet at the time and place specified.

The manufacture of gloves was early introduced into the British Islands, and such was the dignity of the craft that, as early as the reign of King Robert III., the incorporation of gloves of Perth was chartered—a wealthy guild still existing, although the calling has long ceased to characterize that town. The glovers' company of London received its armorial bearings as early as 1464, but the body was not chartered till 1638; and in Worcester, which has long been the principal British

center of the trade, a company was incorporated in 1661.

The glove industry of the present day is both extensive and diversified, seeing that gloves are now almost universally worn, and made of various classes of material and in several different ways. Of yarn, thread, silk and cloth gloves it is unnecessary to speak, as these varieties are, in comparison with leather gloves, of comparatively little importance. The leather employed by glovers is prepared from the skins of deer, sheep and lambs, goats and kids—the last being by far the most important. The skins are prepared either by the ordinary processes of shamoying for wash-leather and doe or buck leather gloves, or by a special method of tawing in the case of ordinary dress gloves. The kid-skins are principally collected by hawkers in the South European countries, and sold in the Leipsic and Naples fairs. The tawing industry is conducted on a great scale at Annonay, Paris, and Milhau in France. The tawing process differs from ordinary tanning in the greater care and cleanliness of all the operations, in the submission of the dressed skins to a brief fermentation by piling them under the influence of heat, which increases the softness and flexibility of the leather, and in tawing with a mixture of flour, the yellow of eggs, and alum. On the completion of this operation, they are stretched by hand and dried as rapidly as possible. Thereafter they are damped, placed in dozens between linen cloths, and worked about to render them soft and pliable, after which they are planed on the flesh side, dried, and again planed. They are then polished by rubbing with a heavy glass disk or other smooth substance, and dyed by brushing liquid dyes over one side. Finally they are stretched on a marble table, and smoothed with a blunt knife. From a kid skin so prepared the materials of three gloves are obtained. The skins are moistened and stretched, and the various parts are cut out by a machine having steel punches the shape and size desired. The thumb piece, the quirks and the fourchettes inserted between the fingers, and the wrist welt—the latter frequently white—are cut out separately. Machine sewing, in which a kind of button stitch is made, is to a small extent utilized in the manufacture of gloves; but the greater part of the sewing is done by hand. The pieces to be sewed together are placed in a machine between a pair of jaws, the holding edge of which is composed of fine saw teeth, between each of which the sewer passes back and forward her needle, and in this way a neat uniform stitch is secured. There are three kinds of hand-sewing in the glove trade—round sewing or ordinary glove stitch, piqué stitch, and prick seam. After sewing, the backs are stitched or tamboored, the button-hole is formed, the wrist attached, and the button sewed on, thus finishing the glove. After damping and stretching to its utmost length, the glove is ready to be stamped and put up for use.

GLOVER, RICHARD, an English poet, was born in 1712, and died in 1785. He wrote several tragedies, and was one of the reputed authors of *Junius*.

GLOVERSVILLE, a manufacturing town of Fulton county, N. Y., noted for its glove production—being the principal source of supply in the Union. It has railroad, banking and telegraph facilities, and a population, in 1900, of 18,349. The city has six schools, costing \$75,000; twelve churches, and a free library, with 9,000 volumes. It is lighted by gas and electricity, well supplied with water, and has five miles of horse railroad. There is a volunteer fire department of seventy-five men, and a paid police department. The city receipts (1900) were \$91,000; city tax, 70 cents on the \$100; assessed valuation, \$5,800,000.

GLOW-WORM. See COLEOPTERA.

GLUCINUM, or BERYLLIUM (Greek γλυκύς, glykys, sweet, from the taste of its salts,) is a metal related most nearly in its physical properties to zinc and mercury, symbol G, atomic weight 9.3. Glucinum was first obtained by Wöhler and Bussey, in 1828, in an impure pulverulent form, by the fusion of its chloride with potassium; and by Debray, in 1854, in the compact state, by the decomposition in an atmosphere of hydrogen of the vapor of the chloride by that of sodium. Heated in air the metal oxidizes superficially, or, if in a state of fine division, burns with brilliancy. The spark-spectrum of glucinum presents two brilliant blue lines. Glucinum may be estimated in minerals, after removal of their silica, in the insoluble form or as fluoride.

GLUCK (not, as frequently spelt, GLÖCK), CHRISTOPHER WILLIBALD, a celebrated operatic composer, was born at Heidenwang, near Neumarkt, in the Upper Palatinate, on July 2, 1714, and died in 1787.

The most notable event in connection with Gluck is, perhaps, the contest which the appearance of his music—notably the opera *Iphigénie*—engendered among the French litterati, in regard to the comparative merits of his productions and the music of the Italians. The victory was, by common consent, declared to be with Gluck. His works were numerous, and nearly uniformly successful, the most celebrated being, perhaps, *Orpheus* and *Eurydice* and *Iphigénie*.

GLÜCKSTADT, a town of Prussia, in the province of Schleswig-Holstein, is situated on the right bank of the Elbe, where it receives the small river Rhin, and on the railway from Itzehoe to Elmshorn, twenty-eight miles northwest of Altona. Population, 2,600.

GLUCOSE (or, more correctly, GLYCOSE), known also as GRAPE SUGAR, STARCH SUGAR, and DIABETIC SUGAR ($C_6H_{12}O_6 + 2H_2O$), seldom occurs in distinct, well-formed crystals, but may be obtained in warty concretions, which, when examined under the microscope, are found to consist of minute rhombic tablets. It is less sweet than ordinary (cane) sugar, and is soluble in water and in dilute alcohol. The two chief varieties are distinguished by their action on polarized light—dextroglucose, which turns the plane of polarization to the right, and levoglucose, which turns it to the left. Glucose is a constituent of the juice of grapes, plums, cherries, figs, and many other sweet fruits, and may often be observed in a crystalline form on raisins, dried figs, etc. It also occurs in honey. The simplest method of preparing pure glucose is by treating honey with cold rectified spirit, which extracts the uncrystallizable sugar; the residue is dissolved in water, and the solution is decolorized with animal charcoal, and allowed to crystallize. It is manufactured on a large scale from starch, obtained from corn.

GLUE. See GELATIN.

GLUKHOFF, or GLUCHOW, as the name is transliterated in German, a town of Russia, at the head of a district in the government of Tchernigoff, 132 miles east of Tchernigoff, on the highway between Moscow and Kieff. Population about 20,000.

GLUTEN, a tough, tenacious, ductile, somewhat elastic, nearly tasteless and grayish-yellow albuminous substance, obtained from the flour of wheat by washing in water, in which it is insoluble. In Martin's apparatus for the preparation of gluten on the large scale, balls of dough are worked backward and forward in troughs by means of cylinders, while water plays upon them in fine jets delivered by copper pipes. A sack of flour may be thus made to yield about 110 pounds of moist gluten, and twice that quantity of dry starch. Good samples of white English wheat contain some 10 or 11 per cent. of gluten; from hard Venezuela wheat as

much as 22.75 per cent. has been procured. The outer and inner coats of wheat, separated from it as bran, contain respectively 4 or 5 and 14 to 20 per cent. of gluten. Gluten, when dried, loses about two-thirds of its weight, becoming brittle and semi-transparent; when strongly heated it crackles and swells, and burns like feather or horn.

GLUTTON, or WOLVERENE, a carnivorous mammal belonging to the *Mustelidæ* or weasel family, but differing from the typical forms of the genus *Mustela* in the greater heaviness and clumsiness of its body, presenting in this respect a striking resemblance to the bear. Its legs are short and stout, with large feet, the toes of which terminate in strong, sharp claws, considerably curved. Its mode of progression is semi-plantigrade. In size and form it is not unlike the European badger, measuring from two to three feet in length, exclusive of the thick bushy tail, which is about eight inches long. Its head is broad, its eyes small, with defective vision, and its back arched. Its fur consists of an undergrowth of short woolly hair, mixed with long straight hairs, to the abundance and length of which on the sides and tail the creature owes its shaggy appearance. The color of its fur is blackish-brown, with a broad band of chestnut color stretching from the shoulders along each side of the body, the two meeting near the root of the tail; while, unlike the majority of arctic animals, the fur of the glutton in winter-time grows darker in color. Like other weasels it is provided with anal glands, which secrete a yellowish fluid possessing a highly foetid odor. The glutton is a boreal animal, inhabiting the northern regions of both hemispheres, but most abundant in the circumpolar area of the New World, where it occurs throughout the British provinces and Alaska, being specially numerous in the neighborhood of the Mackenzie river, and extending southward as far as New York and the Rocky Mountains. Many erroneous statements have been made regarding the glutton by early writers on natural history, from Olaus Magnus to Buffon, one of which has perpetuated itself in the animal's common name,—the fact being that the wolverene is not more gluttonous than are the majority of carnivorous animals. It feeds on grouse and the smaller rodents, and on foxes, which it digs from their burrows during the breeding season. Its want of activity, however, renders it dependent for most of its food on the dead carcasses of animals. These it frequently obtains by methods which have made it peculiarly obnoxious to the hunter and trapper. Should the hunter, after succeeding in killing his game, leave the carcass insufficiently protected for more than a single night, the glutton, whose fear of snares is sufficient to prevent him from touching it during the first night, will, if possible, get at and devour what he can of it on the second, hiding the remainder beneath the snow. He annoys the trapper by following up his lines of marten traps, which often extend to a length of forty or fifty miles, each of which he enters from behind, extracting the bait, pulling up the traps, and devouring or concealing the entrapped martens. So persistent is the glutton in this practice, when once it discovers a line of traps, that its extermination along the trapper's route is a necessary preliminary to the successful prosecution of his business. This is, however, no easy task, as the glutton is too cunning to be caught by the methods successfully employed on the other members of the weasel family. The trap generally used for this purpose is one made to resemble a cache, or hidden store of food, such as the Indians and hunters are in the habit of forming, the discovery and rifling of which is one of the glutton's most congenial occupations,—the bait, instead of being paraded as in most traps, being in this

case carefully concealed, to lull the knowing beast's suspicions. One of the most prominent characteristics of the wolverine is its propensity, akin to that of certain members of the crow family, to steal and hide things, not merely food which it might afterward need, or traps which it regards as personal enemies, but articles which cannot possibly have any interest for it except that of curiosity.

The cunning it displays in unraveling the oftentimes complicated snares set for it forms at once the admiration and the despair of every trapper, while its great strength and ferocity render it a dangerous antagonist to animals much larger than itself, and occasionally even to man. The rutting season occurs in March, and the female, secure in her burrow, produces her young—four or five at a birth—in June or July. In defense of these she is exceedingly bold, and the Indians, according to Cowes, "have been heard to say that they would sooner encounter a she bear with her cubs than a carcajou (the Indian name of the glutton) under the same circumstances." The wolverene has a curious habit which has not hitherto been observed in any other of the lower animals. On catching sight of its relentless human enemy, it may be observed, before finally determining on flight, sitting on its haunches, and, in order to get a clearer view of the danger, shading its eyes with one of its forepaws. When pressed for food it becomes fearless, and has then been known to come on board an ice-bound vessel, and in presence of the crew to seize on a canister of meat. The flesh of the glutton is uneatable; it is therefore only valuable for its fur, which, when several skins are sewed together, forms elegant hearth and carriage rugs.

GLYCAS, MICHAEL, a Byzantine historian, often called Siculus. The time when he flourished is very uncertain. He is justly reckoned among the better Byzantine historians on account of the terseness and perspicuity of his style.

GLYCERIN, GLYCERINE, or GLYCEROL (in pharmacy GLYCERINUM), a sugar-like substance obtainable from most natural fatty bodies by the action of alkalies and similar reagents, whereby the fats are decomposed, water being taken up, and glycerin being formed together with the alkaline salt of some particular acid (varying with the nature of the fat). Owing to their possession of this common property, these natural fatty bodies and various artificial derivatives of glycerin, which behave in the same way when treated with alkalies, are known as *glycerides*. This decomposition into an organic acid and a substance of more or less neutral character is a typical kind of reaction with numerous classes of organic bodies, and is termed *saponification*, from the circumstance that the ordinary process of soap-making consists simply in the formation from natural fatty bodies and alkalies of the alkaline salts of the fatty acids thence derivable, soap being a mixture of these alkaline salts in various proportions, according to the particular purposes for which it is required, and its price. In the ordinary process of soap-making the complementary product, glycerin, remains dissolved in the aqueous liquors from which the soap is separated, and is usually thrown away; in many other instances, however, in which a substance capable of undergoing a reaction of saponification is thus treated, the product complementary to the alkaline salt is the more important of the two.

The fact that soap is obtainable by boiling together oily or fatty substances and alkalies (such as potashes and natron or mineral alkali) was known at an early period of history, being mentioned by Pliny, Galen, Aëtius, and Paulus Ægineta. On the other hand, substances referred to in the Old Testament and translated "soap" refer to the alkali itself and not to the substances prepared from oily bodies and these alkaline matters.

The discovery of glycerin, however, is of modern origin, the body having been first described in 1776 by Scheele under the name of oelsüss, and more fully investigated subsequently by Chevreul, Berthelot, and many other chemists, from whose researches it results that glycerin is a trihydric alcohol, the natural fats and oils, and the glycerides generally, being substances of the nature of compound ethers formed from glycerin by the replacement of the hydrogen of the OH groups by the radicals of certain acids, called for that reason "fatty acids."

Glycerin is also a product of certain kinds of fermentation, especially of the alcoholic fermentation of sugar; thus it is a constituent of many wines and other fermented liquors, being formed together with small quantities of various other substances by reactions subsidiary only to the main change taking place, and hence varying in their nature and extent with circumstances. According to Pasteur, about one-thirtieth of the sugar transformed under ordinary conditions in the fermentation of grape juice and similar saccharine liquids into alcohol and other products becomes converted into glycerin. In certain natural fatty substances, e.g., palm oil, it exists in the free state, so that it can be separated by washing with boiling water, which dissolves the glycerin but not the fatty glycerides; but how far its occurrence in this form is due to the breaking up of the glyceride by a spontaneous saponification is open to some question.

In a state of purity glycerin is a viscid, colorless liquid possessing a somewhat mawkish sweet taste; when exposed to a high degree of cold for a long time it sometimes solidifies to a crystalline mass, which then melts at about 7° C. Under certain conditions, such as prolonged contact with poor cheese and chalk at about 35° to 40° C., it can be made to ferment partially, becoming changed into alcohol; but under any circumstances, only a small fraction, at most a tenth, becomes transformed, the rest remaining unaltered. It possesses remarkable solvent powers on many substances, whence it is employed for numerous purposes in pharmacy and the arts. Its viscid character, and its non-liability to dry and harden by exposure to air, also fit it for various other uses, such as lubrication, etc., while its peculiar physical characters, enabling it to blend with either aqueous or oily matters under certain circumstances, render it a useful ingredient in a large number of products of varied kinds. Applied to the living skin (and similarly to untanned leather) it produces a remarkable softening effect, whence it is largely employed as a cosmetic, either by itself or in admixture with other substances. Taken internally it is alleged to be valuable as a substitute for cod-liver oil for phthisical patients, not possessing the disagreeable fishy flavor of that valuable food, and having a fattening tendency. When it is given in moderately small repeated doses to the lower animals, it does not appear to possess any marked injurious action peculiar to itself; when, however, large doses of glycerine are subcutaneously injected into dogs, amounting to from eight to ten grammes per kilogramme of animal operated on (0.8 to 1.0 per cent. of the weight of the dog, corresponding to from one pound to one and one-half pounds of glycerine for the weight of an average man), death ensues within twenty-four hours, accompanied by symptoms analogous to those of acute alcoholism (Dujardin, Beaumetz, and Audigé). Like sugar, it possesses antiseptic qualities, so that meat, albumen, etc., immersed in it do not for long periods of time undergo putrefactive changes. The simplest modes of preparing glycerine in a state of purity are based on the saponification of fats, either by alkalis or analogous basic substances, or by super-heated steam.

GLYCINE, GLYCOCINE, GLYCOCOLL, or SUGAR OF GELATINE ($C_2H_5NO_2$), occurs in colorless, transparent, rhombic prisms, which have a sweet taste, and are devoid of odor. It is very soluble in water, the solution having no effect on vegetable colors, but is insoluble in alcohol and in ether. Glycine combines both with acids (as hydrochloric, nitric, sulphuric, and oxalic acid) and with metallic oxides, and the compounds in both cases are soluble and crystallizable; they are, however, of no great importance.

GLYCOGEN ($C_6H_{10}O_5 \cdot H_2O$ according to the analysis of Pelouze) is a substance which, in its properties, seems intermediate between starch and dextrine. In contact with saliva, pancreatic juice, diastase, or with the blood or parenchyma of the liver, it is converted into glucose, and hence its name of glycogen. It occurs only in the cells of the liver, where it exists as an amorphous matter, but in the early stage of foetal life, before the liver begins to discharge its functions, instead of being found in that organ, it exists in special cells of the foetal structures known as the placenta and the amnion, and in the muscles, horny tissues, etc. In severe forms of disease, and especially in febrile affections, it seems to be temporarily absent from the liver.

GLYCOL is the type of a new class of artificial compounds, whose existence was inferred, and afterward discovered, a few years ago, by Wurtz. In their chemical relation and properties, they form an intermediate series between the monobasic or monatomic alcohols, of which common alcohol is the type on the one hand, and the class of bodies of which ordinary glycerine is the type, on the other. The name of glycol, formed from the first syllable of glycerine and the last of alcohol, has been given to express this relation.

GLYCOSMIS, a genus of plants of the natural order *Aurantiaceae*, trees, natives of the East Indies and the Mascarene Islands. The fruit of *G. citrifolia*, an East Indian species, is delicious.

GLYPTODON, a gigantic fossil animal belonging, like the megatherium and the mylodon, to the *Edentata*, but of the family of the *Dasytida*, or armadillos. It is found in the post-tertiary deposits of the pampas of South America, and four species have been described. The back and sides of the creature were covered with a carapace of thick, polygonal bony plates, which in some cases was nearly six feet long.

GMELIN, JOHANN GEORG, a distinguished naturalist, son of the chemist of the same name, was born at Tübingen, June 12, 1709, and died in 1755.

GMELIN, LEOPOLD, a celebrated chemist, was born August 2, 1788, at Göttingen. He died at Heidelberg April 13, 1853.

GMELIN, SAMUEL GOTTLIEB, an eminent naturalist, nephew of J. G. Gmelin (see above), was born at Tübingen, June 23, 1743, and died in 1774.

GMÜND, a town of Würtemberg, circle of Jaxt, formerly a free imperial town, is situated in a charming and fruitful valley on the Rems, here spanned by a beautiful bridge, thirty-one miles east-northeast of Stuttgart. Population (1900), 18,699.

GNA, a name (Anglo-Saxon, *gnæt*) properly applied to the members of the *Culicida* (a family of the insect order *Diptera*), but sometimes also used for the *Chironomida*. The *Culicida* consist of about one-hundred and fifty known species, of the genera *Culex*, *Anopheles*, *Aedes*, *Psorophora*, *Corethra*, etc.; they are distributed over the chief divisions of the world, and, in spite of their very feeble build, reach as far north as man has penetrated. As regards time, examples of a *Culex* and a *Corethra* have been discovered in the Tertiary beds of the Lower White River, Colorado. The *Culicida* are distinguished from their immediate allies, among other

characters, by having the parts of the mouth produced into a slender porrected rostrum, nearly half the length of the insect, and composed of many distinct pieces, and many jointed palpi, very long and pilose in the male, in which sex the antennæ are plumose and fourteen-jointed. The fibrils of the antennæ are considered by Mayer as auditory organs. The usual special representative of the family is *Culex pipiens*, the common gnat, whose blood-sucking propensities have rendered it too well known. It pierces the skin with the needle-like lancets of its rostrum, which are barbed at the tips, and gradually inserts the whole of those organs, at the same time liquefying the blood by some fluid secretion, which apparently adds to the subsequent irritation. The female, recognizable by her more simple antennæ and palpi, alone attacks man, and, in default of her favorite food, will feed on the honey of flowers. This blood-sucking taste is shared by the allied *Simuliidae*. The dreaded mosquito is nothing but a species of *Culex*, so closely allied to *C. pipiens* that it is difficult to say where "gnat" ends and "mosquito" begins, though the original mosquito is a native of Cuba. The curious humming noise (from which the name *pipiens* is fancifully derived) accompanying the flight of the gnat is caused by the extremely rapid motion of its wings, which have been calculated to vibrate 3,000 times in a minute,—the great relative bulk of the thoracic muscles accounting materially for this.

GNESEN (Polish, *Gniezno*), the chief town of a circle in the Prussian province of Posen, government of Bromberg, is situated on the Wrzesnia, thirty miles east-northeast of Posen. Pop (1901), about 18,000.

GNIESS, a term introduced from the German as the name for a variety of metamorphic rock, which has the same component materials as granite, and differs from it only in these materials being arranged in layers rather than in an apparently confused aggregated mass. The minerals of which it is composed are quartz, feldspar, and mica. The mica is sometimes replaced by hornblende, producing a gneiss corresponding to the variety of granite called syenite.

GNOME, a pithy and sententious saying, commonly in verse, embodying some moral sentiment or precept. The gnome belongs to the same generic class with the proverb, but it differs from a proverb in wanting that common and popular acceptance which stamps the proverb, as it were, with public authority. In the Bible, the book of Proverbs, part of Ecclesiastes, and still more the apocryphal book of Ecclesiasticus, present, so far as regards language and structure, numberless illustrations of the highest form of this composition.

GNOME, the name given in the cabalistic and mediæval mythology to one of the classes of imaginary beings which are supposed to be the presiding spirits in the mysterious operations of nature in the mineral and vegetable world. They have their dwelling within the earth, where they preside especially over its treasures, and are of both sexes, male and female.

GNOMON. When a rectangle is divided into four parts by cross lines parallel to its sides, the sum of any three of the parts is called the gnomon. See Euclid, b. ii., prop. 5 and seq. Gnomon has also a meaning in dialing.

GNOSTICISM, a general name applied to various forms of speculation in the early history of the church. The term *γνῶσις* (*gnōsis*) is found in the Septuagint translation of the Old Testament, and in the Apocryphal Book of Wisdom, denoting the knowledge of the true God, or knowledge communicated by Him. In the New Testament the word is frequently used by St. Paul, and in the second epistle of St. Peter, to express the saving knowledge of God in Christ; and in the first

epistle to Timothy occurs the significant phrase, "Oppositions of science falsely so called." It may be inferred, therefore, that the use of the simple term, in a bad as well as a good sense, was not unknown to the apostolic age, although the expression Gnostic is said not to be found till the beginning of the second century, when it was first employed by the sect of the Ophites, or, according to some, by Carpocrates. Both expressions were used by the early Christian fathers with the double meaning already indicated. Clement of Alexandria, in his *Stromata* or *Miscellanies*, entitles the enlightened or perfect Christian a Gnostic. He points out at length the distinction between the true Gnostic and the disciples of false systems who laid claim to the name of Gnostics. It is only to systems of the latter kind that the name of Gnosticism is now applied.

The sources of Gnosticism are to be found in diverse forms of religious and speculative culture antecedent to Christianity, especially in the theology of the Alexandrian Jews, as represented in the writings of Philo, and again in the influences flowing from the old Persian or Zarathustrian religion and the Buddhistic faiths of the East. To the theosophic system of Philo, with its mixture of Platonic and Old Testament ideas, some of the most characteristic conceptions of Gnosticism are certainly to be traced, such as the infinite separation between God and the world, and the necessity of a mediating power or powers in the creation of the world. This class of ideas prevailed largely at the time of the introduction of Christianity, especially in Alexandria, which was the great meeting-point of Jewish and Hellenic culture. The more the state of the pre-Christian Jewish mind and Jewish literature is investigated, the more we recognize everywhere a strange commingling of old with new thoughts, of tradition with philosophy, of religion with speculation. The age was in all its aspects eclectic, and the Jewish no less than the Gentile schools of the time were centers for the fusion of old streams of culture from many quarters, and the rise of broader intellectual tendencies. Ever since the captivity, Judaism had borne more or less the impress of the old state religion which it encountered in its exile. How far post-Exilian Judaism was molded by Zarathustrian conceptions is a very difficult question; but no historical student can doubt that its cosmogony, its angelology, and even its anthropology, were largely modified by contact with Persia. But not only was Zarathustrianism active in and through Judaism. In itself, it spread westward, and became directly and indirectly both a precursor and a parent of Gnostic speculation. Certain forms of Gnosticism seem little else than adaptations of the Persian dualism to the solution of the great problem of good and evil. In other forms of it, again, the Pantheism of India seems to have been a pervading influence. This, too, has its representative in the Jewish schools of the time, in the secret doctrines of the Kabbala, which many carry considerably beyond the time of Christ, although the two books through which we alone know these doctrines—the *Book of Creation* and the book called *Rohar* or *Light*—are plainly of much later production. These doctrines sprang up in Palestine, and not among the Hellenistic Jews. The philosophy on which they rest is plainly pantheistic. Whereas the principle lying at the foundation of the theosophy of Philo makes almost an absolute distinction between the Supreme indefinable Source of all things and the world, the philosophic postulate of the Kabbala is the identity of God and the world—the one being the Eternal Substance of which the other is the manifestation and form.

Gnosticism is found reproducing one and all of these conceptions, with the additional idea of *redemption*

directly borrowed from Christianity. In all its forms it may be said to represent the efforts made by the speculative spirit of the time to appropriate Christianity, and to make use of some of its most fertile principles for the solution of the mysteries lying at the root of human speculation. The more advanced writers of the present day refuse to recognize Gnosticism as a *heresy*, or to speak of the Gnostics as deserters from the Christian Church. And they are right so far. The Gnostic schools were always so far outside the church. They were not *heretical*, therefore, in the ordinary sense. But it is no less true that Gnosticism, in all its developments, is only intelligible in its connection with Christianity. It was the impulse of Christian ideas which alone originated it, which constituted the vital force of thought that made it one of the most significant phenomena of early Christian history; and it is only its connection with Christianity which can be said to make it any longer interesting.

The question as to the date of its origin has been much investigated of late. Do we find traces of it in the New Testament writings? or are the supposed allusions to it there to be otherwise explained? It is well known that this question has an important bearing upon other questions as to the origin of some of the New Testament writings, and the special object for which these writings were composed. Without entering into details, or attempting to examine the several passages which may be supposed to contain allusions to Gnosticism in the New Testament, it may be said that such allusions, more or less definite, seem to occur in the later epistles of St. Paul, especially the epistles to the Ephesians and Colossians, and in the Pastoral epistles. The true explanation of all these phrases, as well as much else in St. Paul's writings, is probably the fact that the spirit of Gnosticism, and the language which it afterward developed and applied, were "in the air" of the apostolic age. Its modes of thought, as already seen, were prevalent in Philo and in other quarters, and the tendencies which were afterward worked up into systems, were no doubt in existence in the time of St. Paul, and still more in the later apostolic time. It seems plainly against such tendencies, rather than against any special sects or schools, that the cautions of St. Paul are directed. In the Apocalypse, and in the epistles and gospels attributed to St. John, these tendencies are seen in a more developed, although hardly in a more distinct, state.

The inchoate phase of Gnosticism is represented by men like Simon and Cerinthus, both prominently associated with apostles and sects, such as the Ophites or Naasseni, the Peratæ or Peratics, the Sethiani, and the followers of one Justinus, author of a book called the *Book of Baruch*, which was written probably not earlier than the beginning of the second century. All these sects are elaborately described by Hippolytus in the fifth book of his *Refutation of Heresies*. Simon Magus follows them in his order of treatment (l. v.) There can be little doubt, however, that Simon must be placed in the very front of the history of Gnosticism, in so far as he belongs to this history at all. This is the position that he occupies in the treatise of Irenæus; and his association with St. Peter, as well as the account of him in the apostolic history in which he appears within seven years of the ascension of our Lord, plainly indicates that this is his true position. The character of his teaching, moreover, points to the same conclusion. It is a form of anti-Christianism, rather than any mere depravation of the Christian system. It is true that he is represented in the passage of the Acts of the Apostles already referred to as having professed himself a believer, and having been baptized; but his whole career afterward, and

the doctrines attributed to him, prove that, whatever may have been his feelings for the moment, he neither understood Christianity, nor came under its practical influence in any degree. Probably he regarded the apostles as only magicians of remarkable skill, and enrolled himself for a time in their company in order that he might learn their secrets and be able to exercise their powers. He was plainly an impostor of the first magnitude, who must be credited with a marvelous and unblushing audacity rather than with any clear philosophic or spiritual aims. He recognized Christ as Redeemer, but only as occupying an inferior position to himself. He was the true Logos or Power of God, which had previously in an imperfect degree appeared in Jesus. He himself is "the God who is over all things," and the world was made by his angels." It is clear that a teacher of this kind had little relation to Christianity, except in so far as it came across his own designing and ambitious path. He had knowledge and intellectual address to avail himself of the prevailing conceptions of the Alexandrian philosophy, so as to impart some coherency to his own insane dreams; but he was characteristically a magician (as his character has survived in history) rather than a philosopher or spiritual thinker. He claims the position assigned to him in the history of Gnosticism mainly in virtue of his pupil and successor, Menander, who laid the foundation at Antioch of the Syrian Gnostic school more conspicuously represented by Saturninus and others.

The sects of the Naasseni, the Peratæ, the Sethiani, and the followers of Justin, placed, as we have said, by Hippolytus before Simon, may probably all be ranked along with him and Cerinthus in the early and still undeveloped stage of Gnosticism. It is very difficult to attain to any certainty as to their chronological position. Bunsen traces the origin of the Ophites as far back as the Pauline age; but on very different grounds it may be concluded that the sect, if existent then, could hardly have acquired any prominence or intellectual interest,—not even in the time of St. John; and certain details of their teaching cannot well be earlier than the beginning of the second century.

Another name in the history of Gnosticism, that of Carpocrates, may be classed in this earlier period, although he is said to have been still active as a teacher in the time of Hadrian (117-138). The followers of Carpocrates are represented by Irenæus as first styling themselves Gnostics. His opinions had a certain affinity both with those of Cerinthus and the Ophites. They are described at length by Irenæus and Hippolytus. Both writers also ascribe to this teacher and his disciples a great devotion to magical arts, and accuse them of voluptuousness and even licentiousness of life. They seem to have cherished an esoteric doctrine which inculcated the indifference of all actions, and that nothing was really evil by nature. Some of the teachers of this sect marked their pupils by branding them on the inside of the lobe of the right ear. Epiphaneus, a son of Carpocrates, is associated with his father in the reign of Hadrian as actively promoting the spread of their heresy, and, dying young, he is said to have been worshipped as a god by the inhabitants of a town in Cephalonia, of which his mother was a native. He must have been a remarkable youth, credited as he is with a work on *Justice*, fragments of which have been preserved by Clement of Alexandria, advocating a very outrageous form of communism.

But, as already indicated, it is not till the first quarter of the second century that we see Gnosticism in full and systematic development; and then it ranges from two main centers—Antioch in Syria, and Alexandria.

Menander, the pupil of Simon, settled at Antioch,

and there laid the foundation of the Syrian Gnostic school, whose chief representatives in the second century are Saturninus, Tatian, and Bardesanes, the last two of whom were more or less connected with the church—Tatian, as a pupil of Justin Martyr, and the writer of a harmony of the four gospels under the name of *Diatessaron*, and Bardesanes as one of the first of the interesting series of hymn-writers for which we are indebted to the Syrian church. The Syrian Gnosis is distinguished by its admixture of Zarathustrian elements, and the consequent sharpness and precision with which it seizes the idea of conflict between the powers of Good and Evil—the Supreme God, on the one hand, and the Demiurge and his angels or æons, on the other hand. For a more particular account of the characteristics of the system, see articles on the names above mentioned.

Along with the Syrian school, and occupying a more prominent place in the development of the religious thought of the second century, stands the great school of Alexandrian Gnosticism, represented especially by Basilides and Valentinus and their followers. Basilides appears to have been a native of Syria, and to have taught in Alexandria about the year 125. "He is the first Gnostic teacher," says Bunsen, "who has left an individual personal stamp upon his age. * * * His erudition is unquestionable. He had studied Plato deeply. * * * All that was great in the Basilidean system was the originality of thought and moral earnestness of its founder." Bunsen also maintains that "Basilides was a pious Christian, and worshiped with his congregation," while admitting that his sect fell away from the church and from Christianity by refusing to recognize the authority of Scripture and the necessity of practical Christian communion.

Valentinus was probably educated in the school of Alexandrian Gnosticism, as he developed Gnostic ideas in their connection with Hellenic, rather than Persian, modes of thought into the most elaborate and carefully reasoned system which they reached. He came to Rome about the year 140, and there formed a sect which exercised considerable influence over the commingling speculations of the time which met in that great center.

In addition to these two great schools of Gnosticism there is still a third, especially represented by the famous Marcion of Pontus, whose center may be regarded as Asia Minor. Marcion was the son of a Christian bishop, by whom he is said to have been excommunicated. Following one Cerdon, a Gnostic of Antioch, Marcion distinguished himself by his extreme opposition to Judaism, and generally by a Gnostic attitude at variance with the Old Testament, the God of which is to him the Demiurge in conflict with the Supreme Being and the Christ whom He sent to redeem the world from the power of this Demiurge. His Christology was, of course docetic—the divine power being only united to the man Jesus for a time. He accepted only ten of St. Paul's epistles, and a mutilated copy of the gospel of St. Luke. The teaching of the Clementine fictions and a Jewish sect known by the name of Elkesaites, whose tenets seem to have resembled this teaching, is considered by Mansel and others to constitute a Judaizing reaction from the Pauline Gnosticism of Marcion.

Our readers are referred to special articles for a detailed exposition of these several Gnostic systems.

The fundamental questions with which Gnosticism concerned itself are the same which in all ages have agitated inquiry and baffled speculation, viz., the origin of life and the origin of evil—how life sprung from the Infinite Source—how a world so imperfect as this could proceed from a supremely perfect God. The Oriental notion of matter as utterly corrupt is found to pervade

all Gnostic systems, and to give so far a common character to their speculations. It may be said to be the ground-principle of Gnosticism.

Setting out from this principle, all the Gnostics agree in regarding this world as not proceeding immediately from the Supreme Being. A vast gulf, on the contrary, is supposed to separate them. In the general mode in which they conceive this gulf to be occupied they also agree, although with considerable varieties of detail.

The Supreme Being is regarded as wholly inconceivable and indescribable—as the unfathomable Abyss (Valentinus)—the Unnamable (Basilides). From this transcendent source existence springs by emanation in a series of spiritual powers. It is only through these several powers or energies that the infinite passes into life and activity, and becomes capable of representation.

GNU (*Capotlepas*), a genus of ruminant mammals constituting the equine group of the antelope family, and containing two species—the gnu or kokoon and the brindled gnu. Owing to their singular appearance, which has been aptly compared to that of a creature compounded of a bison's head, a horse's body, and an antelope's legs, their proper zoological position has been a matter of dispute—some placing them among the oxen, while others regard them as a connecting link between bovine animals and the true antelopes. The gnu measures about four feet and half in height at the shoulders, and nine feet in extreme length. Its nose is broad and flattened, and bears on its upper surface a crest of reversed hair, while there is an abundant growth of bushy black hair beneath the chin and between the forelegs. The horns, which are present in both sexes, are very broad at their base, forming a solid helmet on the forehead, from which they bend downward and outward, thereafter curving rapidly upward to the tip. A mane of light-colored hair, tipped with brown, and presenting a neatly clipped appearance, extends along the neck, while the horse-like tail, which is more or less of a creamy color, reaches to the ground. The nostrils are large, and are furnished with a muscular valve by which they can be closed. The gnu is a native of the arid plains of South Africa, where it congregates in considerable herds, its restlessness of disposition leading it to migrate frequently from place to place.

The brindled gnu is a more northerly form, never being found south of the Orange river. It is readily distinguished from the other species by the black color of its tail and mane, the obscure vertical streaks on its body, its more elevated withers, and its extremely long aquiline nose. While equally grotesque in appearance and manner, it is much less spirited and active than the gnu. Its flesh is highly prized by the natives, who also convert its hide into mantles, rendered attractive to South-African taste by being dressed without removing the long hair of the mane and beard.

GOA, a Portuguese settlement on the Malabar or western coast of India. It is bounded on the north by the river Tirakul or Auraundem, separating it from Sávant Wári State, on the east by the Western Gháts, on the south by Kanara district, and on the west by the Arabian Sea. Total area, 1,390 square miles; population (1901), about 500,000.

Goa is a hilly country, especially the recently acquired portion known as the Novas Conquistas. Its distinguishing feature is the Sahyadri Mountains, which after skirting a considerable portion of the northeastern and southeastern boundary, branch off westward across the territory with numerous spurs and ridges. The plains are well watered by large navigable rivers. The most important is the Mandavi river, on whose banks both the ancient and modern cities of Goa stand, with a fine harbor formed by the promontories of Bardez and Salsette.

The port of New Goa or Panjim is divided into two anchorages by the projection of the *cabo* (cape) from the island of Goa, both capable of safely accommodating the largest shipping.

Goa ranks high as regards its early importance among the cities of western India. It emerges very distinctly in the fourteenth century, and was visited by the famous traveler Ibn Batuta. In the fifteenth century it formed the chief emporium of trade on the western side of India. Caravans of merchants brought down its products to the coast, and it was the only city in western India which enjoyed at this period a revenue of £10,000. Its wealth and advantageous situation attracted the Mahometan princes of the Deccan, and in 1469 it was taken by the Bâhmani king. A fleet of 120 ships operated from the sea; the Bâhmani troops forced their way down the passes of the Ghâts; and Goa capitulated. It next passed under the Bijâpûr dynasty, and on the arrival of Albuquerque, at the beginning of the sixteenth century, its military and commercial capabilities at once struck his mind. In 1510 the fleet of Albuquerque, consisting of twenty sail of the line, with a few small vessels and 1,200 fighting men, hove in sight off the harbor. A holy mendicant or *jogi* had lately foretold its conquest by a foreign people from a distant land, and the disheartened citizens rendered up the town to the strangers. Eight leading men presented the keys of the gates to Albuquerque on their knees, together with a large banner which was usually unfurled on state occasions. Mounted on a richly caparisoned steed, Albuquerque entered the city in a triumphal procession, with the Portuguese banners carried by the flower of the Lisbon nobility and clergy amidst the acclamations of an immense multitude, who showered upon the conqueror filigree flowers of silver and gold. Albuquerque behaved well to the inhabitants, but was shortly afterward expelled by the Bijâpûr king. However, he returned a few months later with a fleet of twenty-eight ships, carrying 1,700 men, and after a bloody attack, in which 2,000 Mussulmans fell, forced his way into the town. For three days the miserable citizens were subjected to every atrocity. The fifth part of the plunder, reserved for the Portuguese crown, amounted to £20,000.

GOA POWDER, a drug occurring in the form of a yellowish-brown powder, varying considerably in tint, which has recently been brought to notice by Dr. Fayer of Calcutta as a remedy for ringworm. It derives its name from the Portuguese colony of Goa, where it appears to have been introduced about the year 1852. In 1875 it was shown by Dr. Lima that the substance had been exported from Bahia to Portugal, whence it found its way to the Portuguese colonies in Africa and Asia. The tree which yields it belongs to the genus *Andria* of the natural order *Leguminosæ*, and has been named *A. Araroba*. It is met with in great abundance in certain forests in the province of Bahia, preferring as a rule low and humid spots. The tree is from 80 to 100 feet high, and is furnished with imparipinnate leaves, the leaflets of which are oblong, about one and one-half inches long and three-fourths of an inch broad, and somewhat truncate at the apex. The flowers are papilionaceous, of a purple color, and arranged in panicles. The Goa powder or araroba is contained in the trunk, filling crevices in the heartwood. To obtain it, the oldest trees are selected as containing a larger quantity, and after being cut down are sawn transversely into logs, which are then split longitudinally, and the araroba chipped or scraped off with the ax. During this process the workmen feel a bitter taste in the mouth; and great care has to be taken to prevent injury from the irritating action of the powder on the

eyes. In this state, *i.e.*, mixed with fragments of wood, the Goa powder is exported in casks.

GOÂLPÂRA, the most westerly district of Assam, bounded on the north by Bhutan, east by Kâmrûp, south by the Gârô Hills, and west by Kuch Behar and Rangpur. The district is situated on the Brahmaputra, at the corner where the river takes its southerly course into Bengal. The scenery is striking. Along the banks of the river grow clumps of cane and reed; farther back stretch fields of rice cultivation, broken only by the fruit trees surrounding the villages, and in the background rise the forest-clad hills overtopped by the white peaks of the Himalayas. The soil of the hills is of a red ochreous earth, with blocks of granite and sandstone interspersed; that of the plains is of alluvial formation. Earthquakes are common and occasionally severe shocks have been experienced. The Brahmaputra annually inundates vast tracts of country. Numerous extensive forests yield valuable timber. Wild animals of all kinds are found.

GOÂLPÂRA, the chief town of above district, situated on the left bank of the Brahmaputra. It was the frontier outpost of the Mahometan power in the direction of Assam, and has long been a flourishing seat of river trade.

GOAT. All the species of the genus *Capra* may be divided into two classes, the one being represented by the ibex (see **IBEX**) and the other the goat. The latter class is subdivided into the *ægragus* or wild goat and the domestic goat, of which there are many varieties.

The Wild Goat, or Paseng of the Persians (*Capra ægragus*, Pall.), is an inhabitant of the mountainous regions of Central Asia from the Caucasus to the Himalayas, and is occasionally met with in troops at great elevations. It stands somewhat higher than any of the domesticated varieties of the goat, from which it further differs in its stouter limbs and more slender body. Its neck is short, and is thus fitted to bear the enormous horns, which in the male are larger proportionally than in any other ruminant animal. These measure nearly three feet in length, are obscurely triangular in form, transversely ridged, and are bent backward as in the domesticated varieties. The wild goat of the Himalayas, according to Darwin, when it happens to fall accidentally from a height, makes use of its massive horns by bending forward its head and alighting on them, thus breaking the shock. In the female the horns are exceedingly diminutive, or are altogether wanting. The fur, which over the greater part of the body is short, is of a grayish-brown color, with a black line running along the entire length of the back; the short tail and the muzzle are also black, while the under surface of the neck, and the beard, which are present in both sexes, are of a brown color. The paseng is exceedingly wary of the approach of man, and as its agility is no less remarkable, there has been little opportunity of studying it closely. The concretions known as *bezoar-stones*, which were formerly much used in medicine and as antidotes of poison, are believed to have been originally obtained from the intestines of this species.

Considerable diversity of opinion has been expressed by naturalists as to the original stock of the domestic goat, which is met with in nearly every quarter of the globe,—the now prevalent and the most probable opinion being that the various domestic breeds are severally descended from wild stock now extinct. Both the ibex and the *ægragus* interbreed freely with the common goat, though the produce is not always fertile. Instances of this are not unusual in the Alps and Pyrenees, where goats abound in a semi-domesticated state. Hybrids between the goat and the sheep are also known to have occurred, but are rare.

The following are the chief domestic breeds, possessing distinct characteristics: The Common Goat, the Maltese, the Syrian, the Angora, the Cashmere, the Nubian or Egyptian, and the Dwarf Goat of Guinea.

The Common Goat.—This has many varieties which differ from each other in length of hair, in color, and slightly in the configuration of the horns. The ears are more or less upright, sometimes horizontal, but never actually pendent, as in some Asiatic breeds. The horns are rather flat at the base and not unfrequently corrugated; they rise vertically from the head, curving to the rear, and are more or less laterally inclined. The color varies from a dirty white to a dark brown, but never black, which indicates Eastern blood. Most of the European countries possess more than one description of the common goat.

The Maltese Goat has its ears long and wide and perfectly pendulous, hanging down below the jaw. The hair is long and cream-colored. Specimens of this kind are usually hornless, which is perhaps the cause of it having been called the "Hornless Variety."

The Syrian Goat.—This breed is met with in various parts of the East, in Lower Egypt, on the shores of the Indian Ocean, and in the island of Madagascar. Both its hair and ears are excessively long, the latter so much so that they are sometimes clipped to prevent their being torn by stones or thorny shrubs. Its horns are somewhat erect and spiral, with an outward bend.

The Angora Goat is often confounded with the Cashmere, but is in reality quite distinct from it. The principal feature of this breed, of which there are two or three varieties, is the length and quantity of its hair, which has a particularly soft and silky texture, covering the whole body and a great part of the legs with close matted ringlets. The horns of the male differ from those of the female, being directed vertically and in shape spiral, while in the female they have a horizontal tendency, somewhat like those of a ram. The face has a sheepish expression. The coat is composed of two kinds of hair, the one short and coarse and of the character of hair, which lies close to the skin, the other long and curly and of the nature of wool, forming the outer covering. Both are used by the manufacturer, but the exterior portion, which makes up by far the greater bulk, is much the more valuable. The process of shearing takes place in early spring, and is conducted with the utmost care; the average amount of wool yielded by each animal is about two and one-half pounds. The best quality comes from castrated males, the females producing the next best. The annual export of wool from Angora is estimated at about 2,000,000 pounds, and its value at £200,000. Large herds are shipped at Constantinople and sent to Cape Colony, where this breed thrives well and is largely propagated, the climate being specially suitable to the perfect development of the wool.

The Cashmere Goat.—This animal has a delicate head, with semi-pendulous ears, which are both long and wide. The hair varies in length, and is coarse and of different colors, according to the individual. The horns are very erect, and sometimes slightly spiral, inclining inward and to such an extent in some cases as to cross. The coat is composed, as in the Angora, of two materials; but in this breed it is the under coat that partakes of the nature of wool and is valued as an article of commerce. This undergrowth, which is of a uniform grayish-white tint, whatever the color of the hair may be, is beautifully soft and silky, and of a fluffy description resembling down. It makes its appearance in the autumn, and continues to grow until the following spring, when if not removed, it falls off naturally; its collection then commences, occupying from eight to ten

days. The animal undergoes during that time a process of combing by which all the wool and a portion of the hair, which of necessity comes with it, is removed. The latter is afterward carefully separated, when the fleece in a good specimen weighs about half a pound, being worth between half to three-quarters of a rupee. It is sold by the "turruk" of twelve pounds. This is the material of which the far-famed and costly shawls are made, which at one time had such a demand that, it is stated, "16,000 looms were kept in constant work at Cashmere in their manufacture." Those goats having a short, neat head, very long, thin ears, a delicate skin, small bones, and a long heavy coat, are for this purpose deemed the best. There are several varieties possessing this valuable quality, but those of Cashmere, Thibet and Mongolia are the most esteemed.

The Nubian Goat, which is met with in Nubia, Upper Egypt and Abyssinia, differs greatly in appearance from all those previously described. The coat is in the female extremely short, almost like that of a race-horse, and the legs are very long. This breed therefore stands considerably higher than the common goat. One of its peculiarities is the strongly convex shape of the face, the forehead being very prominent and the nostrils sunk in, the nose itself extremely small, and the lower lip projecting from the upper. The ears are long, broad and thin, and hang down by the side of the head like a "double lop" rabbit. The horns are quite black, slightly twisted, and very short, flat at the base, pointed at the tips and recumbent on the head. But little was known of this breed in Europe—in the West at least—until some ten or twelve years ago, when some were imported into France by the Société d'Acclimation of Paris, who found its milking qualities to surpass those of all other breeds.

The Nepaul Goat appears to be a variety of the last breed, it having the same arched facial line, pendulous ears and long legs. The horns, however, are more spiral. The color of the hair, which is longer than in the Nubian, is black, gray, or white, with black blotches.

The Guinea Goat is a dwarf species originally from the coast whence its name is derived.

The milch goat has been aptly described as the "poor man's cow"—a designation it well merits, for with a couple of these animals the cottager may, at an almost nominal expense, enjoy the same advantages, in a domestic point of view, as the rich man with his "Alderney." Comparatively few are kept in England, because the advantages of goat-keeping are but very imperfectly known, and also on account of the large proportion of land under cultivation. The goat in a state of nature frequents hills and mountainous places, and, in a domesticated condition, it generally gives preference to elevated situations; but it is a mistake to suppose that it will not thrive on low ground. Being naturally adapted to rocks and dry soils, however, it should not be exposed in marshy places, as this brings on disease of the feet, and general ill-health; otherwise there is no animal more uniformly hardy. The common varieties will stand heat and cold equally well, but have a decided objection to storms of wind and rain; when they are left to roam loose, therefore, a rough shed should be erected to shelter them from the weather.

The goat breeds, generally speaking, but once a year. If well housed and under liberal treatment, it will bring forth young twice in twelve months; but this is not advisable. As a rule, at the first birth one kid only is produced, but afterward two, and sometimes three. One has been known for three consecutive years to drop four at a birth; but this is rare, and by no means desirable, as the progeny are sure to be small and thrive badly.

the dam, in most cases, having insufficient milk for so large a family.

GOATSUCKER, a bird from very ancient times absurdly believed to have the habit implied by the common name it bears in many European tongues besides our own. The common Goatsucker (*Caprimulgus europæus*, Linn.), is admittedly the type of a very peculiar and distinct family *Caprimulgidae*, a group remarkable for the flat head, enormously wide mouth, large eyes, and soft, penciled plumage of its members, which vary in size from a Lark to a Crow. Its position has been variously assigned by systematists. Though of late years judiciously removed from the *Passeres*, in which Linnæus placed all the species known to him, Professor Huxley considers it to form, with two other families—the Swifts and Humming-birds—the division *Cypselomorpha* of his larger group *Egithognathæ*, which is equivalent in the main to the Linnaean *Passeres*.

The common Goatsucker of Europe (*C. europæus*) arrives late in spring from its winter retreat in Africa, and its presence is soon made known to us by its habit of chasing its prey, consisting chiefly of moths and cock-chafers, in the evening twilight. As the season advances the song of the cock, from its singularity, attracts attention amid all rural sounds. This song seems to be always uttered when the bird is at rest, though the contrary has been asserted, and is the continuous repetition of a single burring note, as of a thin lath fixed at one end and in a state of vibration at the other, and loud enough to reach in still weather a distance of half-a-mile or more. On the wing, while toying with its mate, or performing its rapid evolutions round the trees where it finds its food, it has the habit of occasionally producing another and equally extraordinary sound, sudden and short, but somewhat resembling that made by swinging a thong in the air, though whether this noise proceeds from its mouth is not ascertained. In general its flight is silent, but at times, when disturbed from its repose, its wings may be heard to snite together. The Goatsucker, or, to use perhaps its commoner English name, Nightjar, passes the day in slumber, crouching on the ground or perching on a tree—in the latter case sitting not across the branch but lengthways, with its head lower than its body. In hot weather, however, its song may sometimes be heard by day and even at noontide, but it is then uttered, as it were, drowsily, and without the vigor that characterizes its crepuscular or nocturnal performance. Toward evening the bird becomes active, and it seems to pursue its prey throughout the night uninterruptedly, or only occasionally pausing for a few seconds to alight on a bare spot—a pathway or road—and then resuming its career. It is one of the few birds that absolutely make no nest, but lays its pair of beautifully-marbled eggs on the ground, generally where the herbage is short, and often actually on the soil. So light is it that the act of brooding, even where there is some vegetable growth, produces no visible depression of the grass, moss, or lichens on which the eggs rest, and the finest sand equally fails to exhibit a trace of the parental act. Yet scarcely any bird shows greater local attachment, and the precise site chosen one year is almost certain to be occupied the next. The young, covered when hatched with dark-spotted down, are not easily found, nor are they more easily discovered on becoming fledged, for their plumage almost entirely resembles that of the adults, being a mixture of reddish-brown, gray, and black, blended and mottled in a manner that passes description. They soon attain their full size and power of flight, and then take to the same manner of life as their parents. In autumn all leave their summer haunts for the south, but the exact time of their departure has hardly been ascertained. The habits of

the Nightjar, as thus described, seem to be more or less essentially those of the whole subfamily—the differences observable being apparently less than are found in other groups of birds of similar extent.

Very nearly allied to this genus is *Antrostomus*, an American group containing many species, of which the Chuck-will's widow (*A. carolinensis*) and the Whip-poor-will (*A. vociferus*) of the eastern United States (the latter also reaching Canada) are familiar examples. Both these birds take their common name from the cry they utter, and their habits seem to be almost identical with those of the Old World Goatsuckers.

GOBELIN, the name of a family of dyers, who in all probability came originally from Rheims, and who in the fifteenth century established themselves in the Faubourg Saint Marcel, Paris, on the banks of the Bièvre. The first head of the firm was named Jehan, and died in 1476. He discovered a peculiar kind of scarlet dye, and he expended so much money on his establishment that it was named by the common people *la folie Gobelin*. To the dye works there was added in the sixteenth century a manufactory of tapestry. So rapidly did the wealth of the family increase, that in the third or fourth generation some of them forsook their trade and purchased titles of nobility. More than one of their number held office of state, among others Balthasar, who became successively treasurer general of artillery, treasurer extraordinary of war, counselor secretary of the king, chancellor of the exchequer, counselor of state, and president of the chamber of accounts, and who in 1601 received from Henry II. the lands and lordship of Brie-comte-Robert. He died in 1603. The name of the Gobelins as dyers cannot be found later than the end of the seventeenth century. In 1662 the works in the Faubourg Saint Marcel, with the adjoining grounds, were purchased by Colbert on behalf of Louis XIV., and transformed into a general upholstery manufactory, in which designs both in tapestry and in all kinds of furniture were executed under the superintendence of the royal painter Lebrun. On account of the pecuniary embarrassments of Louis XIV., the establishment was closed in 1694, but it was reopened in 1697 for the manufacture of tapestry, chiefly for royal use and for presentation. During the Revolution and the reign of Napoleon the manufacture was suspended, but it was revived by the Bourbons, and in 1826 the manufacture of carpets was added to that of tapestry. In 1871 the building was partly burned by the Communists.

GOBI is the name usually applied by European geographers to a vast stretch of desert in Central Asia. Like many other geographical designations, the word is not only of doubtful origin, but in conventional usage has modified its meaning. According to Sir T. Douglas Forsyth, it is originally the Turki for "great;" and Richthofen informs us that by the Chinese it is employed, not as a proper name, but, like Shamo, as a general term for any sandy and desert piece of country. This being the case, the great German geographer proposes to displace the word Gobi in European usage by the Chinese Han-hai or Dry Sea, suggestive as he says not only of the present appearance but also of the former history of the region; but it is to be feared that the older designation has become too familiar, and the disadvantages arising from its use are of too recondate a character to render it likely that his proposal will be generally accepted.

As a sea the Gobi or Han-hai must have been comparable in extent to the Mediterranean, and the ancient coast-line can be pretty clearly recognized. In its present state it may be divided into two distinct basins, the western taking its name from the river Tarim or Tarym,

and the eastern from the Chinese Shamo or "Sand Desert." The Dzungarian valley stretches westward like a gulf. The Tarim basin is bounded on the south by the range of mountains which, under various names applicable to different portions, such as the Kwen-lun and the Altyn-tag, forms the northward rim of the great plateau of Tibet; on the west it comes up to the spurs of the Pamir plateau, and on the north it lies along the foot of the Thian Shan. If we measure from the source of any of its principal tributaries, the Tarim must have a course of more than 1,000 miles. The head-waters rise in the mountains just named, and the more important of them in the south and west. The Khotan river and its confluent the Kara-Kash both descend from the Karakorum mountains, and flow in a generally northward direction; the Zarafshan or Yarkand River, rising in the same range, winds about in the first part of its course so as to enter the Gobi almost from the west; and the Kizil Su or Kashgar River has its numerous head streams in the Kizil Yart mountains belonging to the Pamir plateau. The Aksai River and the Shah Yar are the most important contributions from the Thian Shan. The course of all of these rivers after they enter the Gobi is largely matter of conjecture, and all that can be asserted with confidence is that they unite to form the Tarim, and find their final goal in an inland lake.

The Shamo or eastern basin is quite different in its character. Here we have no large river like the Tarim, and, instead of its boundaries being marked by lofty ranges of mountains from 13,000 to 20,000 feet high, the ground gradually rises in a series of scarcely marked terraces. The central point, at Ozon Khoshu, is the lowest discovered in Central Asia, being only 607 meters (1,948 feet) above the level of the sea.

Marco Polo was the first European who gave a distinct description of the desert of Gobi. He tells us how, on quitting Charchan (the modern Chachan, according to Yule), "you ride some five days through the sands, finding none but bad and bitter water; and then you come to a city called Lop, at the edge of the desert. * * * The length of the desert is so great that it would take a year and more to ride from one end of it to the other. It is all composed of hills and valleys of sand." And then he goes on to speak of spirits that haunt the waste, and syllable men's names, and of strange noises like the tramp and hum of a great cavalcade, of the sound of drums, and a variety of musical instruments. Polo appears to have proceeded east from Khotan to Lob, and then further east to Etsina, on the southern edge of the desert, and afterward to have spent forty days in crossing the desert northward to Karakorum.

GOBY. The Gobies (*Gobius*) are small fishes readily recognized by their ventrals (the fins on the lower surface of the chest) being united into one fin, forming a suction disk, by which these fishes are enabled to attach themselves in every possible position to a rock or other firm substances. They are essentially coast fishes, inhabiting nearly all seas, but disappearing toward the Arctic and Antarctic Oceans. Many enter, or live exclusively in, such fresh waters as are at no great distance from the sea. Between 200 and 300 different kinds are known.

GOD. See THEISM.

GODALMING, a municipal borough and market town of England, county of Surrey, is situated thirty-two miles southwest of London, in a valley on the right bank of the Wey, which is navigable thence to the Thames. Population (1901), about 3,500.

GODAVARI, a river of Central India, which flows across the Deccan from the Western to the Eastern Ghâts, for sanctity, picturesque scenery, and utility sur-

passed only by the Ganges and the Indus. The total length is 898 miles; the estimated area of drainage basin 112,200 square miles. Its traditional source is on the side of a hill behind the village of Trimbak in Nasik district, Bombay, but according to popular legend it proceeds from the same ultimate source as the Ganges, though underground. Its course is generally southeasterly.

The upper waters of the Godâvari are scarcely utilized for irrigation, but the entire delta has been turned into a garden of perennial crops by means of the anicut at Dhaulaishvaram, from which three main canals are drawn off. The river channel here is three and a half miles wide. The anicut is a substantial mass of stone, bedded in lime cement, about two and a half miles long, 130 feet broad at the base, and twelve feet high.

GODÂVARI, a district of Madras presidency, British India, bounded north by the Central Provinces and Vizagapatam district, east by Vizagapatam and the Bay of Bengal, south by the Bay of Bengal and Kistna district, and west by the Nizâm's dominions. The district is divided by the Godâvari river into two nearly equal parts. Area 7,345 miles; population, 1,800,000.

GODEFROL. See GOTHFRED.

GODFREY OF BOUILLON. See BOUILLON, on page 1066.

GODERICH, a city and port of entry of Ontario, Can., is situated on Lake Huron, 160 miles from Buffalo. It has a good harbor and a thriving trade. The manufactures include woollens, machinery, leather, castings, boots and shoes, and much salt is shipped. Population (1901), 4,158.

GODOLPHIN, SIDNEY GODOLPHIN, EARL OF, was a cadet of an ancient family of Cornwall, and was born most probably in 1635. He held office under the various sovereigns of England from Charles II. to Queen Anne, serving under William, prince of Orange, although more than suspected of treasonable correspondence with James II. after his expulsion from the throne. On the accession of Queen Anne he was made lord treasurer (the office he had held before under William of Orange), which position he held till 1710. He died September 15, 1712.

GODOY. See ALCUDIA.

GODWIN, FRANCIS, a distinguished English author, son of Doctor Godwin, bishop of Bath and Wells, was born at Havington in Northamptonshire in 1561. In 1601 he published his *Catalogue of the Bishops of England since the first planting of the Christian Religion in this Island*, a work which procured him in the same year the bishopric of Llandaff from Elizabeth. He is also the author of a somewhat remarkable story, published posthumously in 1638, and entitled *The Man in the Moon, or a Discourse of a Voyage thither, by Domingo Gonsales*, written apparently sometime between the years 1599 and 1603. He was the author of several other works of minor importance. He died in 1633.

GODWIN, MARY WOLLSTONECRAFT, an English authoress of the last century, was born at Hoxton, on April 27, 1759. Her principal productions are: *Mary, a Fiction; Original Stories from Real Life; A Vindication of the Rights of Woman and Letters from Norway*. She also translated *The Elements of Morality* and Lavater's *Physiognomy*. She was for some time the mistress of an American, Captain Imlay, by whom she had a daughter. On her separation from Imlay she attempted suicide by drowning, but was rescued. She afterward married William Godwin, by whom she had one daughter, Mary, who became the wife of the poet Shelley. She died September 10, 1797.

GODWIN, WILLIAM, an English political writer,

historian, novelist and dramatist, was born March 3, 1756, at Wisbeach, in Cambridgeshire, and died in 1836. He was the husband of the subject of the preceding article. His first published work was an anonymous *Life of Lord Chatham*. In 1793 Godwin published his great work on political science, *The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness*. Although this work is little known and less read now, it was one of the epoch-making books of English thought. In May, 1794, Godwin published the novel of *Caleb Williams, or Things as they are*, a book of which the political object is overlooked by many readers in the strong interest of the story. It is one of the few novels of that time which may be said still to live.

GODWINE, son of Wulfnoth, earl of the West-Saxons, is the leading Englishman in the first half of the eleventh century, and he holds a special place in English history generally. He is the first Englishman who plays the part of a minister and parliamentary leader, of one high in office under the crown who at the same time sways the assemblies of the nation by his power of speech.

His birth and origin are utterly uncertain. There are two alternative statements, which are seemingly quite irreconcilable, but either of which alone would have much to be said for it. By putting together certain passages in the English Chronicles, in Domesday, and in the will of the Ætheling Æthelstan, son of King Æthelred, a strong presumption is raised that Godwine was the son of Wulfnoth the South-Saxon who was outlawed in 1009, and that his services in the war against Cnut were deemed to entitle him to a restitution of his father's forfeited lands. There is no direct statement to this effect, but a number of undesigned coincidences point toward such a belief. On the other hand, there is a story which appears in various quarters, and which seems to come from more than one independent source, which makes Godwine's father Wulfnoth a churl somewhere on the borders of Gloucestershire and Wiltshire, and which makes Godwine win the favor of the Danish earl Ulf by showing him his way after the battle of Sherstone in 1016. A third account connects Godwine with the family of Eadric the traitor of Æthelred's day; but this version seems at once to be impossible to reconcile with either of the other two stories, and to rest on less authority than either.

But, whatever was Godwine's origin, there is no doubt that, according to Cnut's rule of preferring Englishmen to high office, he rose to power very early in that king's reign. He was an earl in 1018. The next year he distinguished himself at the head of the English troops in Cnut's Northern wars, and received in marriage Gytha, the sister of the king's brother-in-law Earl Ulf. In 1020 he became earl of the West-Saxons, that is, of all England south of the Thames, a new office, doubtless connected with Cnut's frequent absences from England. All this again is not in the Chronicles, though particular points are incidentally confirmed by them. Still this stage of his history seems to be fairly made out from other sources.

From Cnut's death in 1035 the events of Godwine's life are recorded in the Chronicles, often with great minuteness. Much is also learned from the contemporary biographer of Eadward. He asserted the claims of Harthacnut, the son of Cnut and Emma, to the crown of his father; but he had to consent to a division of the kingdom, and could only secure Wessex for Harthacnut, while Harold reigned in Northumberland and Mercia. He then acted as the chief minister of Emma, while she was regent on behalf of Harthacnut during his first reign. During this time the Ætheling

Ælfred, son of Æthelred and Emma, landed in England in the hope of winning back his father's crown; but coming into the power of Harold, he was blinded by his order, and died of his wounds. Godwine was said to have betrayed Ælfred to Harold, and the charge was eagerly seized upon by the Norman writers. But it was not invented by them. At the beginning of Harthacnut's second reign in 1040, Godwine was formally accused of the death of Ælfred, and was regularly tried and acquitted. Godwine remained in power during the reigns of Harold and Harthacnut, and on the death of the last-named king in 1042, he was foremost in promoting the election of Eadward, the son of Æthelred and Emma, to the vacant throne. As earl of the West-Saxons he was the first man in the kingdom, but his power was still balanced by that of the other great earls, Leofric in Mercia and Siward in Northumberland. His sons Swegen and Harold, together with Beorn, the nephew of his wife Gytha, were promoted to earldoms, (1043-1045), and his daughter Eadgyth was married to the king (1045). We hear much of his good and strict government of his earldom, and of his influence with the king and with the whole nation. He was not, however, all-powerful; in one very remarkable case, which is most instructive as a piece of constitutional history, he was out-voted in the witenagemot on a question of foreign policy. In 1047, when his wife's nephew Swegen Estrithson, now king of the Danes, was at war with Magnus of Norway, Godwine proposed to help Swegen with fifty ships; but the notion was opposed by Leofric, and "all folk" accepted the amendment of the Mercian earl. Godwine had also to strive against the king's fondness for Normans and other strangers, above all in the disposal of ecclesiastical offices. Godwine's policy in this and in other matters, was opposed to all French connections of every kind. Next to Englishmen he favored natives of the kindred Continental lands, and he supported a policy of alliance with the empire and its princes. In all this, at home and abroad, he had specially to withstand the influence of the king's Norman favorite, Robert of Jumièges, appointed bishop of London in 1044 and archbishop of Canterbury in 1051. Godwine was supported by the English bishops Stigand of Winchester and Lyfing of Worcester. The appointment of Robert to the archbishopric marks the decline of Godwine's power; the foreign influence was now at its height, and the English earl was to feel the strength of it.

In the course of 1051 a series of outrages committed by the king's foreign favorites led to a breach between the king and the earl. The king's brother-in-law, Eustace count of Boulogne, returning with his followers from a visit to the king, tried to obtain quarters by force in the houses of the burgesses of Dover. An Englishman who withstood them was killed, a fight followed, in which the count and his company were driven out of the town. The king, hearing the tale from Eustace, bade Godwine inflict military chastisement on the townsmen; the earl refused, and demanded a fair trial of the charge before the witan. About the same time men's minds were stirred by the outrages of several Normans who had received estates in Herefordshire. The influence of the archbishop was used against Godwine, and he was summoned to appear before the witan at Gloucester as a criminal. He and his sons now gathered the whole force of their earldoms, and marched toward Gloucester in arms. They demanded the surrender of Count Eustace and of the other strangers who had done outrages, whether at Dover or in Herefordshire. The king called the other earls to his help; war was hindered by the mediation of Leofric, and matters were adjourned to another meet-

ing in London. There the king appeared with an army; Godwine and his sons were arraigned as criminals, and, on refusing to appear without a safe conduct, were outlawed. Godwine and his whole family now left the kingdom, except his daughter, the Lady Eadgyth, who was banished from court to the monastery of Wherwell. The foreign favorites of the king were now supreme.

The next year the tide turned; the feeling of the nation showed itself in favor of Godwine. When his petition for a removal of his outlawry was refused, he came back from his shelter in Flanders at the head of a fleet. In most parts of England he was welcomed; he sailed up the Thames to London; the army gathered by the king refused to fight against him; and, in a great meeting outside the walls of London, he and his family were restored to all their offices and possessions, and the archbishop and many other Normans were banished. Godwine's friend Stigand succeeded to the archbishopric. The next year Godwine was smitten with a fit at the king's table, and died three days later, April 15, 1052. His death was worked up into a fabulous tale by his Norman enemies.

GODWIT, a word of unknown origin, the name commonly applied to a marsh-bird in great repute, when fattened, for the table, and formerly abundant in the fens of Norfolk, the Isle of Ely, and Lincolnshire.

The Godwits belong to the group *Limicola*, and are about as big as a tame Pigeon, but possess long legs, and a long bill with a slight upward turn. It is believed that in the genus *Limosa* the female is larger than the male. While the winter plumage is of a sober grayish-brown, the breeding-dress is marked by a predominance of bright bay or chestnut, rendering the wearer a very beautiful object. The Blacktailed Godwit, though varying a good deal in size, is constantly larger than the Bar-tailed, and especially longer in the legs. The species may be further distinguished by the former having the proximal third of the tail-quills pure white, and the distal two-thirds black, with a narrow white margin, while the latter has the same feathers barred with black and white alternately for nearly their whole length.

America possesses two species of the genus, the very large Marbled Godwit or Marlin, *L. fedoa*, easily recognized by its size and the buff color of its axillaries, and the smaller Hudsonian Godwit, *L. hudsonica*, which has its axillaries of a deep black. This last, though less numerous than its congener, seems to range over the whole of the continent; breeding in the extreme north, while it has been obtained also in the Strait of Magellan and the Falkland Islands. The first seems not to go further southward than the Antilles and the Isthmus of Panama.

GOES, or TER GOES, a town of the Netherlands in the province of Zealand, on the island of South Beveland, with railway communication since 1868 with Bergen-op-Zoom, and since 1872 with Middelburg, its distances from these places being respectively twelve and fifteen miles.

GOES, HUGO VAN DER, a painter of considerable celebrity at Ghent, was known to Vasari, as he is known to us, by a single picture in a Florentine monastery. The date of his birth is unknown; he died in 1482.

GOETHE, JOHANN WOLFGANG VON, was born in Frankfort on August 28, 1749. His parents were citizens of that imperial town, and Wolfgang was their only son and their eldest child. His father was born on July 31, 1710, and in 1742 received the title of imperial counselor. He married on August 20, 1748, at the age of thirty-eight, Catherine Elizabeth Textor, a girl of seventeen. Her family was better than his own, and held a higher position in the town. Her father was

imperial counselor, and had been schultheiss or chief magistrate. In December, 1750, was born a daughter, Cornelia, who remained until her death, at the age of twenty-seven, her brother's most intimate friend. She was married in 1773 to John George Schlosser. The house in which Goethe was born is still to be seen in the Hirschgraben. His education was irregular; he went to no school, and his father rather stimulated than instructed him. But the atmosphere by which he was surrounded gave him, perhaps, the best education he could have received. Goethe must have been brought up with the ambition to take his degree at the university as a doctor, to return home and become an advocate, to make a rich marriage, to go through the regular course of civil offices, to inherit his father's house, and perhaps one day to be burgo-master. His home was a cultivated one. The father was fond of art and of the German poetry then in fashion. French culture gave at this time the prevailing tone to Europe. Goethe could not have escaped its influence, and he was destined to fall under it in a special manner. In the Seven Years' War, which was now raging, France took the side of the empire against Frederick the Great. Frankfort was full of French soldiers, and a certain Comte Thorane, who was quartered in Goethe's house, had an important influence on the boy. Still more strongly was he affected by the French company of actors, whom he came to know both on and off the stage. He learned to declaim in this manner passages of Racine without understanding a word of them. At a later period he knew French thoroughly well, and composed both prose and poetry in that language. His first writings were imitations of the French manner; his earliest play was the imitation of a French after-piece.

In the autumn of 1765 Goethe, who had just completed his sixteenth year, traveled to Leipsic and was admitted as a student of the Bavarian nation, one of the four into which the university was divided. For his lodging he had two neat little rooms in the Feuerkugel, the Fire Ball, looking into the long court-yard which leads from the old market to the new. He was sent to Leipsic to study law, in order that he might return to Frankfort fitted for the regular course of municipal distinction. For this purpose he carried with him a letter to Professor Böhme, who taught history and imperial law in the university, but had no other distinction to recommend him. He told Professor Böhme that he intended to devote himself not to law but to belles lettres, or, to use the word which F. A. Wolf had invented, philology. Böhme did his best to dissuade him, and in this was assisted by his wife. The effect of their advice was rather to disgust Goethe with modern German literature, to make him despise what he had already written, and to drive him into the distractions of society, which wasted both his time and his money. He did, however, attend some lectures. His position toward the professors of his university was not an enviable one. His real university education was derived from intercourse with his friends. First among these was J. G. Schlosser, who afterward married his sister. Goethe used to dine with him at a table d'hôte kept by a wine-dealer, Shönkopf, in the Brühl, in a house which still exists. Schlosser, who was at this time private secretary to the duke of Würtemberg and tutor to his children, was ten years older than Goethe. He had a great influence upon him, chiefly in introducing him to a wider circle of German, French, English, and Italian poetry. At the table of Professor Ludwig, where Goethe had previously dined the conversation had generally turned on medical and scientific subjects. Another friend of Goethe's was Behrisch, tutor to the young Count Lindenau. He probably had a consid-

erable effect in producing the simplicity and naturalness of Goethe's early style.

But the person who had the strongest effect on Goethe's mental development was Adam Frederick Oeser, at this time director of the academy of arts in Leipsic. Goethe always spoke of Oeser's influence with the greatest affection and respect.

The end of Goethe's stay at Leipsic was saddened by illness. One morning at the beginning of the summer he was awakened by a violent hemorrhage. For several days he hung between life and death, and after that his recovery was slow, although he was tended with the greatest anxiety by his friends. He finally left Leipsic far from well on August 28, 1768, his nineteenth birthday.

Goethe made an enforced stay of a year and a half in his native town. It was perhaps the least happy part of his life. He was in bad health. During his stay at Frankfort he wrote very little. It may be that the two Leipsic dramas received here their completed form. A farce in memory of his Leipsic life, a poetical letter to Frederike Oeser, the daughter of his teacher, a few songs, some of them religious, make up the tale of his productions, as far as we know them.

He arrived at Strasburg April 2, 1770. It was intended that after a sojourn in the university of that place he should visit Paris, the center of refinement. Goethe stayed in Strasburg till August 28, 1771, his twenty-second birthday, and these sixteen months are perhaps the most important of his life. During them he came into active contact with most of those impulses of which his life was a development. If we would understand his mental growth, we must ask who were his friends. He took his meals at the house of the Fräulein Lauth in the Krämergasse. The table was mainly filled with medical students. At the head of it sat Salzmann, a grave man of fifty years of age. His experience and his refined taste were very attractive to Goethe, who made him his intimate friend. Goethe was soon drawn by the studies of his companions to desert his own. A note-book of this date is preserved, which gives us a full account of his studies and employments. He attended lectures on anatomy, on midwifery and on chemistry. His own studies were chiefly devoted to the last science; and he did not forget his favorite alchemy. He had brought with him to Strasburg introductions to pietistic circles, and this made him at first somewhat staid and retired in his pleasures, and disinclined for general society. This soon wore off, and the natural cheerfulness of his genial nature returned to him. Two songs, *Blinde Kuh* and *Stirbt der Fuchs so gilt der Balg*, refer to the social life of this period. He went on picnics, he wrote French poetry, he took dancing lessons, he learned the violoncello. The table of the Fräulein Lauth received some new guests. Among these was Jung-Stilling, the self-educated charcoal-burner, who in his memoir has left a graphic account of Goethe's striking appearance, his broad brow, his flashing eye, his mastery of the company, and his generosity of character. Another was Lersé, a frank open character who became Goethe's favorite, and whose name is immortalized in *Götz von Berlichingen*. His diary also shows that he spent much time in philosophical speculation. But the most important event of his Strasburg sojourn was his acquaintance with Herder. He was five years older than Goethe. Herder was then traveling as tutor to the young prince of Holstein-Eutin, but was obliged to spend the whole winter of 1770-71 in Strasburg on account of an affection of his eyes. Goethe was with him every day, often all day. Herder, who was a pupil of a more original genius, Hamann, taught him the true value of nature in art and the prin-

ciples of what we should now call the romantic school. He made *Ossian* known to him, and the wealth of popular poetry in all nations which the publication of *Ossian* revealed; he enchanted him with the idyllic simplicity of the *Vicar of Wakefield*; but, above all, he shook his sensibility to the roots by revealing to him the power of the mighty Shakespeare. He now saw how far superior Homer was to his Latin imitators, and how false were the canons of French art. Goethe's spirit was liberated from its trammels, and *Götz* and *Faust* and *Wilhelm Meister* became possible to his mind. At a later period he forged for himself fetters of a different kind.

Goethe's stay at Strasburg is generally connected still more closely with another circumstance — his passion for Frederike Brion of Sessenheim. At least ten songs are addressed to her, and several others were written for her.

Goethe's return to Frankfort is marked by a number of songs, of which the *Wanderer's Sturmlied* is the most remarkable. He found his Frankfort existence more intolerable than before. These months were full of literary activity. To them belong an oration on Shakespeare, delivered at Frankfort, an essay on Erwin von Steinbach, the builder of the Strasburg cathedral, two theological treatises of a neologistic character on the commandments of Moses and the miraculous tongues of Pentecost, and a number of reviews written for the *Frankfurter Gelehrte Anzeiger*, which had been founded by Merck. But the work into which he threw all his genius was the dramatization of the history of the imperial knight of the Middle Ages, Gottfried or Götz von Berlichingen. The immediate cause of this enterprise was his enthusiasm for Shakespeare. After reading him he felt, he said, like a blind man who suddenly receives his sight. The unities of time and place vanished into nothing. The true form of art was seen to be that which holds the wayward impulses together by an invisible bond, just as in the life of man necessity is wedded to free will. The study of a dry and dull biography of Götz, published in 1731, supplied the subject for his awakened powers. From this miserable sketch he conceived within his mind a complete picture of Germany in the sixteenth century. The chief characters of his play are creatures of his imagination representing the principal types which made up the history of the time. Every personage is made to live; they speak in short sharp sentences like the powerful lines of a great master's drawing. The first sketch of Götz was finished in six weeks, in the autumn of 1771. Cornelia was consulted at every stage in the work. Herder saw it, and gave his approval. On his return from Wetzlar in 1773 Goethe wrote the piece over again, and published it, with the help of Merck, in the form in which we now possess it. It ran like wild-fire through the whole of Germany. It was the progenitor, not only of the *Sturm und Drang* period to which it gave the tone, but of the romantic knightly literature which teemed from the German press. At a later period, in 1804, Goethe prepared another edition for the stage, which took five hours in acting. It has never been represented since.

With the manuscript of *Götz* in his pocket, Goethe left Frankfort in the spring of 1772 for Wetzlar, a quiet country town on the Lahn, one of the seats of Government of the Holy Roman Empire. The emperors lived at Vienna; they were crowned at Frankfort; they held their parliaments at Ratisbon, and at Wetzlar their courts of justice. It was the custom for young lawyers to attend the sittings of these courts for a certain time before they could be admitted to practice on their own account. The company of these students of

the embassies from the component parts of the empire, and of various imperial officials, made the society a pleasant and lively one. Goethe soon found friends. The secretary of the Brunswick legation, Goué, formed a round table of knights,—a Ritter-tafel. The members adopted names from the age of chivalry, and apportioned among themselves the neighboring villages as commanderies and fiefs. Goethe took the name of Götz. Deeds of prowess were performed in friendly rivalry, chiefly of eating and drinking. This masquerade at least served to keep the idea of Götz constantly before his mind. But the place has sadder associations. It is impossible to dissociate the name of Wetzlar from that of Werther. The Deutsches Haus, then the property of the knights of the Teutonic order, exists still in the main street of Wetzlar. It was occupied by one of the officials of the order, by name Buff, an honest man with a large family of children. The second daughter, Lotte, blue-eyed, fair, and just twenty years of age, was first met by Goethe shortly after his arrival at a ball at Wolpertshausen. She strongly attracted him; he became a constant visitor at the house. He found that Lotte was a second mother to her brothers and sisters, and he delighted to play games with them and tell them stories. Lotte was really though not formally engaged to Kestner, a man of two-and-thirty, secretary to the Hanoverian legation. The discovery of this relation made no difference to Goethe; he remained the devoted friend to both. He visited Lotte and her children; he walked with Kestner about the streets till midnight; they kept their common birthday together in the German house, on August 28th; Kestner felt no jealousy; Goethe was content with Lotte's friendship; her heart was large enough for both. But the position was too critical to last. On September 10th they met in the German house for the last time. Lotte spoke of the other world, and of the possibility of returning from it. It was arranged between them that whoever died first should appear to the others. This conversation confirmed Goethe's purpose; he determined to go away. He made no adieu, but wrote a line to Kestner to say that he could not have borne to stay a moment longer. Merck had probably persuaded him to this step. To divert his mind he took him to Ehrenbreitstein and introduced him to Sophie la Roche, the friend of Wieland's youth, and to her daughter Maximiliane, with whom Goethe was charmed. The places in the neighborhood of Coblenz were visited. Goethe returned to Frankfurt by the river in a yacht. Here he was possessed with the memory of Lotte. He fastened her silhouette over his bed. Kestner came to Frankfurt in September. Goethe and Schlosser went together to Wetzlar in November. Here he heard of the death of Jerusalem, a young man attached to the Brunswick legation. He had been with Goethe at the university of Leipsic, but he had seen little of him at Wetzlar. Of a moody temperament, disheartened by failure in his profession, and soured by a hopeless passion for the wife of another, he had borrowed a pair of pistols from Kestner under pretense of a journey, and had shot himself on the night of October 29th.

Goethe obtained a full narrative of the circumstances from Kestner, and immediately afterward began his *Werther*, in which the circumstances above related are all interwoven. Goethe tel's us that it was written in four weeks, but this can hardly have been the case. We have notices of its slow progress during the whole of the summer of 1773. In 1774 it is far advanced enough to be shown to some intimate friends. It is not till the middle of September, 1774, that two copies of the book are sent in the greatest secrecy to Sophie la Roche and Lotte Buff. In October it spread over the whole of

Germany. It was enthusiastically beloved or sternly condemned. It was printed, imitated, translated into every language of Europe, criticised in every periodical, with the fullest meed of praise or scorn. It made the round of the world, and penetrated even to China. The *Werther* fever wrung the hearts of men and women with imaginary sorrows; floods of tears were shed; young men dressed in blue coats and yellow breeches shot themselves with *Werther* in their hands. It opened the floodgates of pent-up sentimentalism which had been stirred by the philosophy of the time, and which the calamities of the next generation were sternly to suppress. It may be imagined that Kestner and Lotte were not well satisfied with the liberty which Goethe had taken with them. They were married on April 4, 1773, and Goethe provided the wedding ring. Notwithstanding the coolness which the publication of *Werther* produced between them, the correspondence between Goethe and Kestner continued to the end of the century. Lotte saw Goethe in Weimar in 1816, when she was sixty-three years old; she was still beautiful, but her head shook with palsy. She died in 1828. The second part of *Werther* represents the agony of a jealous husband. This was inspired by Bretano, an Italian merchant resident in Leipsic, a widower with five children, who had married Maximiliane, the daughter of Sophie la Roche. Goethe loved her as an elder brother, but her husband scarcely approved of the intimacy. *Götz* and *Werther* formed the solid foundation of Goethe's fame. They were read from one end of Germany to the other.

These two great works were not the only occupations of Goethe at this time. In Wetzlar he had translated Goldsmith's *Deserted Village*, and had written a number of small poems addressed to Lotte. The spring of 1773, which witnessed the publication of *Götz*, saw him actively employed as an advocate. His relations with his father became easier. His literary success brought him a number of friends,—the young Counts Stollberg, and Von Schönborn, a friend of Klopstock's. He also began to correspond with Lavater the physiognomist and with Klopstock himself. To the latter half of this year are to be referred a number of satirical poems, aimed at prevailing follies of the time, clever and amusing, but of little permanent value. In *Peter Brey* he satirized the meddler Leuchsenring, who, with soft tread and lamb-like manners, interfered with the family relations of Herder. *Satyros* is directed against the prophets of the school of nature, who bid us return to nature without remembering how coarse and repellent some aspects of nature are. Bahrdt had translated the Bible into modern cultivated German; Goethe wrote a prologue to this newest of divine revelations, in which the four evangelists appear each with his attendant animal. The most important of these writings is *Gods, Heroes, and Wieland*, a dialogue in the style of Lucian written at a sitting over a bottle of Burgundy, in which Alcæstis, Mercury, Hercules, Euripides, and other ancient worthies appear to Wieland in all their original greatness, and upbraid him with the mean and paltry representation of them which he had given to the world. Wieland was the apostle of an emasculated antiquity. Goethe would make the gods speak in their own large utterance if they spoke at all. Wieland revenged himself by recommending the satire in his paper, the *Deutsche Merkur*, as a delicate piece of persiflage worthy of the study of his readers. In November Goethe's sister Cornelia was married to Schlosser and left Strasburg. Goethe felt the loss deeply. She lived but a short time. Her married life was tortured with perpetual suffering, and she died in 1777.

The beginning of 1774 is marked by a new passion and a new work. Crespel had invented a plan for en-

livening their social meetings; each man was to draw lots for a partner, and for the time to consider her as his wife. Three times Goethe drew the name of Anna Sibylla Münch, a pleasant girl of sixteen, daughter of a merchant. One of the favorite topics of the day was the trial of Beaumarchais, which ended on February 16, 1774. Immediately afterward his *Mémoires* or pleadings were published, and from the fourth of these the play of *Clavigo* was arranged. It represents a young writer of ambition deserting the woman to whom he is engaged and breaking her heart. The fifth act, in which Clavigo kills himself, is Goethe's own. The real Clavigo died, a distinguished man of letters, in 1806. The piece was written in eight days, and published on June 1st. It had a great success, and still keeps the stage. But Goethe's best friends were disappointed with it. Merck told him not to write such trash, as others could do that as well. In reality there is no period of Goethe's life in which his literary activity was so prodigious, or when he was more fully occupied with literary plans which had reference to the deepest problems of human nature. To this time belong the conceptions of *Cæsar*, *Faust*, *Mahomet*, the *Wandering Jew*, and *Prometheus*. The first was soon given up; of the second the first monologue, the dialogue between Faust and Mephistopheles, and part of the scenes with Gretchen, were now written. He has told us in his *Autobiography* what he intended to make of *Manomet*. In five acts he was to show us how the purity of prophetic zeal is recognized by love, rejected by envy, sullied by human weakness, spiritualized by death. To write this drama he had studied the Koran through and through; only a few fragments were completed. Of the *Wandering Jew* very little remains to us. The design, conceived in Italy, of making a great work on the subject was never carried out. The *Prometheus* was completed in two acts. The monologue of the *Prometheus* included in the *Lyrical Poems*, was written at the same time; but it is doubtful whether it was intended to form part of the drama. These works are to be referred to the study of the ethics of Spinoza, for whom he now began to feel a deep reverence, which continued throughout his life. The calm repose of Spinoza's mind spread over his own like a breath of peace; his systematic and well-ordered reasoning was the best antidote to Goethe's passionate waywardness. Goethe now acquired a wider view of all the relations of the moral and natural world; he felt that he had never seen the world so clearly. His time at Frankfort was also largely occupied with art. His room was covered with the works of his pencil, and a number of poems on the subject of the artist's life arose from the same influence.

The summer of 1774 was spent in a journey to the Rhine. On July 12th Basedow, the educational reformer, came to Frankfort; three days afterward Goethe went with him to Ems, where he found Lavater, who had been with him in the previous month. The three went down the Lahn together, and reached Coblenz on July 18th. Here the famous dinner took place at which Lavater explained the secrets of the Apocalypse to a clergyman, Basedow demonstrated the uselessness of baptism to a dancing master, while Goethe, the worldling between the two prophets, made the best of his time with the fish and the chicken. They then went down the Rhine to Elberfeld, where Goethe found his old Strasburg friend Jung-Stilling, and back to Pempelfort, near Düsseldorf, the house of Fritz Jacobi, where Goethe also met Jacobi's wife Betty, his sister Charlotte, his aunt Johanna Fahlmer, and his friend W. Heinse. Their letters are full of the effect which he produced upon them.

Goethe returned to Frankfort at the beginning of

August. The autumn brought new friends, drawn to him by the fame of the newly published *Werther*. Among these was Klopstock, twenty-five years older than Goethe, and author of the *Messiah*, the acknowledged head of German poets. On December 11th Goethe was surprised by the visit of a stranger, whom he at first took for Fr. Jacobi. It was Karl Ludwig von Knebel, who was traveling with the two young princes of Saxe-Weimar, the reigning duke Karl August, then just seventeen, and his younger brother Constantine. They were on their way to France with their tutor, Count Görz, and they could not pass through Frankfort without making the acquaintance of the new genius who had risen upon their country. Goethe went to see them, was warmly received, and talked with them about the condition and prospects of Germany. This meeting decided the future course of Goethe's life. Knebel thought Goethe "the best of men, the most lovable of mankind." The princes invited him to visit them at Mainz, where they would stay longer than at Frankfort. The visit lasted from December 13th to 15th, when they went on to Carlsruhe, where the duke was to meet his intended bride. Goethe took the opportunity of reconciling himself with Wieland, who lived in Weimar. On his return he found Fräulein von Klettenberg dead. Frederike was lost to him, Charlotte, Maximiliane, and his sister married. Some attachment was a necessity of his nature. He now came under the influence of Lili Schönmann, the daughter of a rich banker, whose father was dead, but whose mother conducted the business, and held one of the most brilliant salons in Frankfort. This passion seemed to be of a more lasting nature than the others. Goethe was drawn into the whirl of society. He is described as moving in brilliantly-lighted rooms, in a gold-laced coat, passing from party to concert, from concert to ball, held captive by a fair-haired girl with a pair of bright eyes. Such was Goethe in the carnival time. To Lili's influence we owe several of his smaller poems, *Neue Liebe neues Leben*, *Herz mein Herz was soll das geben*, *Heidenröslein*, and two little vaudevilles, *Erwin und Emire* and *Claudine von Villa Bella*. The first contains some pretty songs, notably "Das Veilchen," set to music by Mozart. It is founded on the ballad of *Edwin and Angelina*, in the *Vicar of Wakefield*. The latter half belongs to an earlier period, and is complete in itself. *Claudine von Villa Bella* has one good character, the prodigal son Crugantino; and the ballad which is sung at the crisis of the plot was written during the Rhine journey with Jacobi. To this period also belongs *Stella*, a comedy for lovers, a strange, wild play, full of extravagant passion. The weak-minded hero Fernando marries two wives, one after the other. They meet together in an inn, and he is reduced to extremity of misery. He loves them both, and they both love him. Finally, the first wife Stella surrenders her rights, and they agree all to live together. The play in this form suggested to Canning the parody of the *Rovers, or the Double Arrangement*. In 1806 Goethe altered the close by making Fernando shoot himself and Stella take poison. It is seldom performed, but Stella is a fine character for a great actress. It is said to be founded on an occurrence in the Jacobi family.

Neither family approved of the engagement between Goethe and Lili. Goethe's parents thought Lili too much of a fine lady; they had a suspicion, which was well founded, that her wealth had no very sure foundation. Frau Schönmann did not think that Goethe, with all his genius, would make a good husband for her child. Cornelia Schlosser was strongly opposed to the match. Goethe tore himself away, and went for a tour in Switzerland. His companions were the brothers

Stolberg, noisy, wild young nobleman, who in May had stayed at Goethe's house. They gave Goethe's mother the name of Frau Aya, which she ever afterward retained. On his journey Goethe visited the duke of Saxe-Weimar and his betrothed at Carlsruhe, his sister at Emmendingen, Lavater at Zurich. He bore with him the constant memory of Lili; he wore a golden heart which she had given him round his neck. He climbed the St. Gotthard on her birthday, and looked with longing eyes to the promised land of Italy. But a stronger power drew him home again, and he returned. At Strasburg he met his old friends, and saw Zimmermann, the writer on solitude. He showed him a profile of Frau von Stein who lived at Weimar, with which Goethe was enchanted.

He returned to Frankfort on July 20th. August was spent delightfully with Lili at Offenbach; his letters speak of nothing but her. September and the fair-time at Frankfort brought back his troubles. His position is described in the poem *Lili's Park*. He is the half-tamed bear who is held by magic bands among the birds and the fish, and yet sees a door left a little open for escape, and swears that he has the power to pass it. During this last period of his passion he translated part of the Song of Solomon. He wrote some scenes in *Faust*—the walk in the garden, the first conversation with Mephistopheles, the interview with the scholar, the scene in Auerbach's cellar. *Egmont* was also begun under the stimulus of the American rebellion. A way of escaping from his embarrassments was unexpectedly opened to him. The duke of Weimar passed through Frankfort both before and after his marriage, which took place on October 3d. He invited Goethe to stay at Weimar, and it was arranged that one of the duke's household, who was expected every day with a new carriage, should bring him with him. He took leave of everyone, including Lili. But the carriage did not come; a second leave-taking was impossible. He remained all day in the house working at *Egmont*, going out only at night. Once he stood by Lili's window, heard her sing his songs, and saw her shadow on the curtain. He could not linger longer in the town. He started for Heidelberg hoping to meet the carriage, determined if it did not come to go on to Italy. He was summoned hastily back by a messenger, found the carriage at Frankfort, and entered Weimar in the early morning of November 7, 1775. It was not for his happiness or for Lili's that they should have married. She afterward thanked him deeply for the firmness with which he overcame a temptation to which she would have yielded.

At this time the smaller German courts were beginning to take an interest in German literature. Before the Seven Years' War the whole of German culture had been French. Even now German writers found but scant acceptance at Berlin or Vienna. The princes of the smaller states, shut out from the great world of politics, surrounded themselves with literature and art, and with men who would be likely to give an interest to their lives. The duke of Brunswick had made Lessing his librarian at Wolfenbüttel, and had not objected to the publication of *Emilia Galotti*. Emerich Joseph, the worldly elector and archbishop of Mainz, was devoted to Munich and the theater, and made his stage one of the best in Europe. The margrave of Baden had invited Klopstock to his court, and delighted to associate with himself the author of the *Messiah*, the "poet of religion and of his country." The duke of Würtemberg paid special attention to education; he promoted the views of Schubart, and founded the school in which Schiller was educated. Hanover offered a home to Zimmermann, and encouraged the develop-

ment of Schlegel. Darmstadt was specially fortunate. Caroline, the wife of the landgrave, had surrounded herself with a literary circle, of which Merck was the moving spirit. She had collected and privately printed the odes of Klopstock, and her death in 1774 seemed to leave Darmstadt a desert. Her daughter Louise, the youngest of eight children, seemed to have inherited something of her mother's qualities, veiled by a serious and retiring temper. She married on October 3, 1775, the young duke of Weimar, who was just of age. She reigned over that illustrious court, respected and admired, but repelled rather than attracted by its brilliancy and eccentricity. The place which she would naturally have occupied was taken by the duchess Amalia, mother of the grand-duke. She was of the house of Brunswick, and, after two years of marriage, had been left a widow at nineteen, with two sons. She committed their education to Count Görz, a prominent character in the history of the time. She afterward summoned Wieland to instruct the elder, and Knebel to instruct the younger. The *Deutsche Merkur*, founded in 1773, to diminish the influence of the school of Klopstock, gave Weimar importance in the literary world. The duchess was a great lover of the stage, and the best play writers of Germany worked for Weimar. The palace and the theater were burnt down in 1774, and the duchess had to content herself with amateurs. After her son's marriage, she lived in the simple country houses which surround the capital, the lofty Ettersburg, the low-lying Tiefurt, the far-seeing height of Belvedere. Each of these was awakened to new life by the genius of Goethe. The duke, eighteen years of age, was simple in his tastes, a hater of etiquette and constraint, true, honest and steadfast, fond of novelty and excitement, of great courage and activity; his impulses, rarely checked, led him rather to chivalrous enterprise than to undesirable excess.

Upon this society Goethe, in the strength and beauty of youth, rose like a star. From the moment of his arrival he became the inseparable and indispensable companion of the grand-duke. He subdued the affections of all he met with. Wieland said that his soul was as full of him as a dewdrop of the morning sun. He was, take him all in all, the greatest, best, most noble human being that God had ever created. The first months at Weimar were spent in a wild round of pleasure. Goethe was treated as a guest. In the autumn, journeys, rides, shooting parties, in the winter, balls, masquerades, skating parties by torchlight, dancing at peasants' feasts, filled up their time. Evil reports flew about Germany; the court of Weimar had a bad name; Klopstock wrote letters of solemn advice, and forbade his young friend Stolberg to accept an appointment which the duke had offered to him. We do not know, and we need not examine, how much of these reports was true. Goethe wrote to Klopstock that if Stolberg came he would find them no worse, and perhaps even better, than he had known them before. We may believe that no decencies were disregarded except the artificial restrictions of courtly etiquette. Goethe and the duke dined together and bathed together; the duke addressed his friend by the familiar *thou*. Goethe slept in his chamber, and tended him when he was ill. In the spring he had to decide whether he would go or stay. In April the duke gave him the little garden by the side of the Ilm, with its lofty roof, in which he lived for the next eight years. In June he invested him with the title, so important to Germans, of geheimlegationsrath, with a seat and voice in the privy council, and an income of £180 a year. By accepting this he was bound to Weimar forever. We may here mention the different grades of service through which Goethe

passed. In January, 1779, he undertook the commission of war; on September 5, 1779, he became geheim-rath; in September, 1781, he received an addition to his salary of £30. This was afterward raised by £60 more, and in 1816 he received £450, with an additional allowance for the expense of a carriage. In April, 1782, he was enobled by the emperor, and took for his arms a silver star in an azure field; in June of the same year he became president of the chamber *ad interim*. We know that Goethe devoted himself with industry and enthusiasm to the public business; he made himself acquainted with every part of his master's territory; he did his best to develop its resources; he opened mines and disseminated education; he threw himself with vigor into the reconstruction of the tiny army. A complete account of his labors cannot now be given. We shall one day probably find that Goethe cannot be fairly charged with want of patriotism, or coldness to the national interest, and that his apparent indifference to the rising of 1813 must be considered in connection with his resistance to the encroachments of Austria at an earlier time.

Besides numerous visits to the court of the Thuringian princes, sojournings at Dornberg and at Ilmenau, that retired nook of the Weimar fatherland which still attracts many a pilgrim lover of Goethe, the first ten years at Weimar were interrupted by longer journeys. One of these was the winter Harz journey in December, 1777, undertaken suddenly to make the acquaintance of Plessing, a self-torturing hypochondriac, who had written to the poet for advice. With Goethe's help Plessing recovered from his melancholy, visited him at Weimar, and entertained him as professor at Duisburg on his return from the campaign in France. A visit to Dessau inspired the improvements of the park and grounds at Weimar, which now make it so attractive. The close of 1779 was occupied by a winter journey to Switzerland, undertaken with the duke and a small retinue. Two days were spent at Frankfurt with Goethe's parents. Sessenheim was visited, and left with satisfaction and contentment. At Strasburg they found Lili happily married, with a new-born child. At Emmendingen Goethe stood by his sister's grave, and saw her successor Johanna Fahlmer, Jacobi's aunt. The Swiss journey began at Basel. The chief object of it was to forward the health and education of the young duke. It was a bold plan to execute in October and November. From Bern they made the tour of the Bernese Oberland. From Geneva, by the advice of De Saussure, they visited Mont Blanc and the valley of Chamouni; they crossed the Furka, not without danger, in the middle of November, descended the St. Gotthard to Lucerne, and visited Lavater at Zurich, the seal and summit of their tour. From this time Lavater lost his influence over Goethe, and in 1786 he would gladly have run away from Weimar to avoid him. In December they went by the Lake of Constance and the falls of the Rhine to Stuttgart, where, on December 14, Goethe saw Schiller for the first time. He was a student at the academy, and in Goethe's presence received the prize.

The return to Weimar, on January 13th, was the beginning of a new era. The period of genius and eccentricity was at an end; that of order and regularity succeeded. As an outward sign of the change, the duke cut off his pigtail, an example which was long without imitators. Wieland said that the Swiss winter journey was the greatest of Goethe's dramas. In the same serious mood Goethe began to write history. He chose for his subject Duke Bernhard of Saxe-Weimar, the knight-errant of the Reformation. He spent much time and trouble in collecting materials, but at length reasonably concluded that his strength lay elsewhere. At this

time also he began to write *Tasso*, and adapted the *Birds* of Aristophanes to modern circumstances. His deeper thoughts were concentrated in *Wilhelm Meister*. Countess Werther, the sister of the great minister Baron von Stein, whom he visited at Neunheiligen, was transferred in living portraiture to its pages. His efforts for the development of the duke's dominion naturally led him to the study of science. The opening and direction of mines induced him to study geology; the classification of ancient forms of life led him to osteology and anatomy. Goethe was always fond of children. The young Herders and Wielands spent much time in his garden, sometimes digging for Easter eggs which had been carefully concealed. In the spring of 1783 Fritz, the son of Charlotte von Stein, then ten years old, came to live with him in his garden house. In the autumn they took a journey together in the Harz. At Ilmenau was written the touching poem of that name on the duke's birthday. Goethe reviews in it their common friendship and activity as far as it has yet gone, and a few days afterward, as he slept in the hut on the Gickelhahn, he wrote in pencil the world-known lines in which he anticipates for himself that rest and silence which then held enchained the summits of the hills and the birds of the wood. In the following year another journey was undertaken in the Harz for the study of mineralogy. But this was only a relaxation from more serious affairs. In 1785 the Fürstenbund or league of princes was formed, under the supremacy of Frederick the Great, to resist the ambition of Austria under Joseph II. The duke of Saxe-Weimar took an important part in forming this league, and in the negotiations which preceded it. Goethe was his indispensable adviser, and must on this occasion, if not on others, have taken a keen interest in politics and in the independence of Germany.

The year 1786 marks an epoch in Goethe's life. He had now been ten years in Weimar, and he must have felt that his own inward development, and the work which he was most fitted to do in the world, were not advancing as favorably as they should. He had written little of first-rate importance. His *Lyrics* were of intense beauty and of deep meaning, but they were short and fugitive. He had brought with him from Frankfurt the sketches of *Faust* and *Egmont*, but little had been done to them since. His occasional writings for the amateur theater, or for court festivities, were not such as to add to his solid reputation in Germany. *Iphigenie* was the one great work of poetry which belongs entirely to this period, but that had not received its final form. *Tasso* was conceived, but only two acts were written, and these in prose. *Wilhelm Meister* is the most exact expression of this portion of Goethe's life; but loftily as it now towers above the level of his dramas, it did not then satisfy the author, nor was it in a state to be published. For the completion of these works Goethe required leisure and repose, impossible to obtain in the distraction and pleasures of the court. This became more apparent to him as he set himself to collect his scattered writings. Four volumes were soon completed, but the preparation of the other four convinced him how much labor many of his poems still required for perfection.

Of still deeper interest and importance were his scientific researches. In these he aspired to detect the secrets of nature; he succeeded in seeing, as in a vision, the great scheme of evolution applied to all phenomena of the natural and moral world, which the labors of many workers have revealed to us in our own day. He longed for time and leisure to perfect these ideas, to base them on solid fact. Goethe has not added much of positive value to the treasury of scientific truth, but he deserves the credit of having discerned the right method

of inquiry when it was obscure to many, and of having thrown that glow of imagination over dry and technical inquiry, without which no great and important discoveries can be made. His inquiries into the nature of light belong to a later time. He began with physiognomy under the auspices of Lavater. From this he was led to the study of anatomy, and especially to the comparison of the skeletons of men and animals. In this department he made a real discovery, that the intermaxillary bone which exists in the lower animals is found in the human subject in a rudimentary state—that it is seen distinctly in youth, but as years advance is united with the body of the skull. The discovery that the skull itself is only a development of the vertebrae of the spine was made a little later. He was led to this further step by picking up the head of a sheep on the shore of the Lido at Venice. The care of his garden cottage naturally led him to the study of plants. He soon found himself attracted to wide and comprehensive generalizations. The *Metamorphoses of Plants* was not published till 1790, but the idea which had possession of his mind was a solid contribution to the science of botany. Goethe sought to discover an original or standard flower, from which, as from a Platonic ideal type, all existing flowers were deflections and aberrations. In this he followed an unscientific method, but he clearly saw that all the different parts of the plant, except the stem and the root, might be regarded as modifications of the leaf; that leaf, calyx, corolla, bud, pistil, and stamen were all referable to the same type; and that whether a plant produced leaves, or flowers, or fruit, depended on the differentiation of the nutrition which it received. Less fortunate were his speculations in geology, to which he devoted a very large portion of his time and thoughts. It is something that he recognized the importance and reality of that science, then in its infancy, which has had to undergo more than its due share of obloquy and distrust. But he was of necessity a follower of Werner, who based his classifications of rocks rather on the minerals which they contained than upon an examination of the fossil remains of organic life. All these causes contributed together to one end. His desire to complete the great poetical works which he had begun, to disentangle his life from the complexities which had entwined themselves round it, to give a fair trial to his impulses toward art, to afford opportunity for the careful and systematic interrogation of nature, and, above all, a longing to possess his soul in peace, and solemnly to probe in silence the depths of his own being, conspired together to drive him from Weimar to the land which he had yearned after from boyhood. The resolution, slowly formed, was boldly executed. In the summer of 1785 he had visited Carlsbad for the first time, passed a pleasant month in the company of the duchess Louise, Herder, and Frau von Stein. In July, 1786, he paid it a second visit. After five weeks of brilliant society, very favorable to his health, spent in revising his works for the press, he stole secretly away. The duke alone knew that he designed an absence of some duration. In the strictest incognito, in the guise of a German merchant, he drove alone to the land of the citron and the orange.

Goethe's Italian journey, the most momentous epoch in the development of his intellectual life, lasted from September 3, 1786, to June 18, 1788. Assuming the common German name of Müllner, in the strictest incognito he journeyed by way of Munich, where he studied the picture gallery and the collection of antiquities; by the lake of Garda, where he began his metrical version of the *Iphigenie*; by Verona, where he saw the first specimen of Roman building in Italy, in the stupendous amphitheater; by Vicenza, where he was

attracted by the grace and harmony of the classical Palladio; by Padua, where he neglected the frescoes of Giotto, but rose to a clear conception of the form of the *original plant* by the marks on the leaves of a palm in the botanical garden; to Venice, where for the first time he was able to taste the charm and richness of southern life. As he proceeded farther, Ferrara spoke to him of Tasso; Bologna showed him the great masters of the academic school who have now grown pale and dim before the predecessors of Raphael; Florence interested him a little; Assisi drew his attention, not to the triple church of Saint Francis, the unrivaled museum of religious art, but to the little ruined temple which no modern traveler would notice but for the name of Goethe; Spoleto again delighted him with the remains of ancient architecture. He reached Rome on October 28th. His first stay was till February. The constant companion of his studies was the painter Tischbein, who helped him to disentangle the many difficulties of the old Rome and the new. He lived chiefly among the German artists and men of letters who frequented the Caffè Greco. Among these were Angelica Kauffmann and Moritz, who deepened his knowledge of German versification, and prepared him for the composition of *Iphigenie*. Although Goethe occupied himself chiefly with drawing, he was able to announce on June 6th, that his work was finished. The second *Iphigenie*, written in verse, was the first important fruit of the Italian journey. It is in very strong contrast with *Götz von Berlichingen*. It is written in the strictest classical form. Although based on the *Iphigenia in Tauris* of Euripides, it has little in common with it.

Toward the end of February Goethe left Rome for Naples. Here he was attracted less by the remains of antiquity, even the new revelations of Herculaneum and Pompeii, than by the prospects of nature, the bay, the islands, the volcano, the thousand beauties which make the gulf unrivaled in the world, and by the multitudinous and teeming life which throngs the endless quays that line the shore. Sorrento stimulated him to the revival of *Torquato Tasso*, but he did not complete the drama till his return from Italy. It did not appear in print till the spring of 1790. The play had a special fascination for him as a picture of his own distracted life. He could depict with feeling the struggle between the actual and the ideal, the ill-assortment of a passionate poet with the jealous and artificial environment of a court. At the end of March Goethe sailed to Sicily; rolled up in his cloak he meditated the composition of his *Tasso*. Sicily struck him, as it must strike all travelers who have studied the ancient world, as a revelation of Greece. It is, if one may say so, more Greek than Greece itself. Its mountains, streams, trees, flowers, the form of its boats and pottery, the habits of the people, the quivering smile of the bright blue sea fringed with golden sand, represent completely the Greece of the *Odyssey* and of the choruses of Euripides. Goethe was overmastered by this powerful influence. He sketched and began *Nausicaa*, the story of the *Odyssey* in dramatic form, which always remained a fragment. He returned to Rome in June. The rest of the year was spent in the city and its neighborhood, in the serious study of drawing, for which unfortunately he had but little talent, and in the composition of *Egmont*, a work begun with the approval of his father in the early Frankfurt days. It was finished in September, 1787, and appeared in the Easter of the following year. The carnival of 1788 was of importance to his experience. He wrote some scenes of *Faust*: especially the scene in the witches' kitchen was composed in the Borghese gardens. At the end of April he took a sad farewell of Italy, and arrived at Weimar in the middle of June.

From this time his life takes a new color. He had learned in Italy not only new principles of art,—not only that a work of art, whatever of Gothic ornament it may possess, must be solid, firm and simple in its construction as a Grecian temple,—but he had also learned that life itself should be a work of art. He was determined henceforth to be himself, to break the bonds which had confined him and the distractions which had confused him, to possess his soul sacred and inviolable for the purposes of his life. He was relieved of the presidency of the chamber and of the war commission, but in a manner which did him the greatest honor. In the autumn of 1788, walking aimlessly through the park, he met Christiane Vulpius, a young girl who presented him with a petition in favor of her brother. She had golden curling locks, round cheeks, laughing eyes, a neatly rounded figure; she looked, as has been said, “like a young Dionysus.” Goethe took her into his house, and she became his wife in conscience, and the mother of his children. He did not marry her till 1806, when the terrors of the French occupation made him anxious for the position of his eldest son. She had but little education, and he could not take her into society; but she made him a good and loving wife, and her quick mother-wit made her available as an intellectual companion. To these days of early married life belong the Roman elegies, which, although Italian and pagan in form, in color and in sensuality, were written in Germany from home experiences.

In the spring of 1790 he traveled to Venice to meet the duchess Amalia. The Venetian epigrams, still more outspoken in sensuality than the Roman, were the fruit of this journey. In the autumn of the same year he accompanied the duke to Silesia, the first of those military journeys which strike so discordant a note in the harmonious tenor of his existence. The year 1791 offered a quiet contrast to the movement of the year before. He began to take a more special interest in the university at Jena, in which his young friend Fritz von Stein had now entered as a student, and his time was more and more occupied with the study of colors, the least happy and successful of his scientific labors. In the autumn of 1791 Goethe was able to devote himself regularly to a task which had informally occupied his first years in Weimar. The new theater was completed, and Goethe was made director of it. It was in this capacity that he was best known to the citizens of Weimar. He had the final decision on every detail of piece, scenery, and acting; in later years his seat was in a large arm-chair in the middle of the pit, and applause was scarcely permitted until he gave the signal for it. The German stage owes perhaps as much to Goethe as to Lessing. The *répertoire* of the Weimar theater was stocked with pieces of solid merit which long held their place. Shakespeare was seriously performed, and the actors were instructed in the delivery of blank verse. Stress was laid on the excellence of the *ensemble* against the predominance of particular stars. The theater was considered as a school not only of elevating amusement but of national culture. Goethe wrote the *Gross Cophita* for the Weimar stage, a piece founded on the history of Cagliostro and the diamond necklace. He was fascinated by the story as a foreboding of the coming horrors of the Revolution. In these events he was destined to take a more active part than he expected. In August, 1792, he accompanied the duke to the campaign in the Ardennes. Passing by Frankfort, where he visited his mother, he joined the allied armies at Longwy. He beguiled the tedious siege of Verdun by writing an account of his theory of colors in a leaky tent; and on the disastrous day of Valmy, which he recognized as the birth of a new era,

he sought the thickest of the fight that he might experience the dangerous rapture of the cannon-fever. He retreated with the Prussian army, spent five weeks with his friend Jacobi at Pempelfort, and on his return to Weimar at the end of the year found that the duke had built him a spacious house in the square where the joint statues of Goethe and Schiller now stand, in eternal memory of their friendship. In 1793 he went with his master to the siege of Mainz. He continued his optical studies during the bombardment, witnessed the marching out of the garrison, and was one of the first to enter the conquered town. He received leave to withdraw, and went to his mother at Frankfort, and persuaded her to sell the old house and its contents, and to provide a more convenient home for her old age. There was some talk of her coming to Weimar. In the autumn of this year the duke left the Prussian service, and Goethe could look forward to a period of peace. He was chiefly occupied with the management of the theater, and for this he wrote two pieces, both of which had reference to the politics of the time. The *Bürger-general* is a satire on the Revolution, and was long a stone of offense to Goethe's friends, who thought he should have hailed with delight the birth of a new era.

Thus far he had produced but little since his return from Italy. He was now to undergo the most powerful influence which had as yet affected his life. His friendship with Schiller was now to begin, an alliance which, in the closeness of its intimacy and its deep effect on the character of both friends, has scarcely a parallel in literary history. If Schiller was not at this time at the height of his reputation, he had written many of the works which have made his name famous. He was ten years younger than Goethe. The *Räuber* plays the same part in his literary history as *Götz* plays in that of Goethe. This had been followed by *Fiesco* and *Kabale und Liebe*. The second period of Schiller's life had begun with his friendship with Körner, and his residence in Saxony. Here he wrote the *Hymn of Joy*, and completed *Don Carlos*. In 1787 he settled at Weimar. He found the place deserted, the duke in the Prussian camp, Goethe in Italy. He applied himself to history, wrote the *Revolt of the Netherlands*, and studied the literature and art of Greece. In 1789, mainly upon Goethe's recommendation, he was made professor of history at the university of Jena, although he was afraid lest the scholars should discover that they knew more history than the teacher. He made a successful marriage, and worked seriously at his *History of the Thirty Years' War*. In 1794 Schiller had arranged with the publisher, Cotta of Augsburg, whose name is from this time indissolubly connected with the history of German literature, for the production of a new literary journal. It was to be called the *Horen*, and the most distinguished German writers were to contribute to it. Goethe accepted the invitation willingly. The work was designed to mark an epoch in German taste, and it did so. It soon had two thousand subscribers. Among those who promised to contribute were not only Matthiesson, Herder, Knebel, Fritz Jacobi and Gleim, but the brothers Humboldt, the veteran Kant, the youthful Fichte, who had just begun to lecture in Jena, and, at a later period, the brothers Schlegel. Schiller opened the first number of the journal with his letters on the “Æsthetic Education of the Human Race.” Goethe contributed the “Unterhaltungen deutscher Ausgewanderten,” a series of stories told by a number of German emigrants who had been driven to cross the Rhine by the invasion of the French. The most remarkable of these stories is the “Märchen,” a wild and mystic tale, which has been the subject of as much controversy and of as many interpretations as the second part of *Faust*. Goethe also published in

the *Horen* the "Römische Elegien," the flavor of which even Karl August found a little too strong. The first effect of Schiller's influence on Goethe was the completion of *Wilhelm Meisters Lehrjahre*. He had conceived the plan of the work twenty years before, and the first six books had been written before the Italian journey. It was now finished by the addition of two more books. It stands in the first rank of Goethe's writings. He has aimed in it to attain to perfect objectivity of tone, to represent men as they are, and to pass no judgment upon them. The hero passes with weak irresolution through a number of ordinary circumstances, apparently the sport of fortune and the play-thing of chance, yet all these experiences have their definite result in the training of his character. Like the son of Kish, he goes forth to seek his father's asses and finds a kingdom. The unearthly charm of the child Mignon, the dark fate which shrouds the aged herper like the doom of Œdipus, the uncertain yearning after a happier home in brighter climes, give a deeper undertone to the prevailing lightness of the story. The style is exquisitely soft and flowing. It has the sweetness and simplicity of *Werther*, but is more mellow and more mature. The sixth book is occupied with the *Bekenntnisse einer schönen Seele*, a piece of the autobiography of Goethe's early friend Fräulein von Klettenberg, altered to suit its new surroundings. The *Musen Almanach* for 1796, edited by Schiller, was enriched by some of Goethe's most exquisite poems—*Die Nahe des Geliebten*, *Meeres Stille*, and *Glückliche Fahrt*. The storm of criticism which was aroused by the *Horen*, and the little success which, after the first numbers, it met with from the public, determined the two friends to retaliate upon their aggressors. The poems of Martial contain a number of epigrams written in two lines, describing the numberless little presents or *xenia*, which it was customary for friends to exchange at Rome during the time of the Saturnalia. The name was borrowed by the two poets, and the *Xenien* was a convenient vehicle for the expression of their opinion on every subject. The newspapers of the day were the first object of attack, but they soon went further afield. The epigrams were written in Schiller's rooms at Jena. It is impossible to fix the authorship of the *Xenien*; one conceived the idea, the other wrote the lines; one wrote the hexameter, the other the pentameter; they intended the authorship as well as the ownership of the copyright to be one and indivisible. Notwithstanding this, the collection has been broken up. There is no guarantee that the epigrams which appear in the separate works of either poets were really written by the authors to whom they are ascribed; some are reprinted in the works of both; some have remained unprinted altogether. They appeared in the *Musen Almanach* for 1797, together with the Venetian elegies mentioned above. It is needless to say that they roused the writers whom they attacked to unspeakable fury, and were the occasion of a copious literature. A more solid result of the friendship between the poets was the production of *Hermann und Dorothea*. It is a German idyll; the story is taken from the sufferings of Lutherans driven out in the early part of the eighteenth century from the province of Salzburg, but Goethe has given it the character of his own time. He had seen much of the suffering produced by the French Revolution, and he wished this poem to be a reflection in a tiny mirror of the storms and convulsions of the great world. In its literary form it is a descendant of Voss' *Luiise*. It was conceived at Ilmenau in August, 1796, and finished in the following spring. Schiller tells us how it was composed with extraordinary ease and rapidity. During nine days Goethe produced 150 lines a day. The lines

thus hastily written underwent a careful revision. Contemporaneous with *Hermann und Dorothea* is the production of *Wallensteins Lager* by Schiller, which was written with the advice and assistance of his brother poet. The completion of this cycle of plays falls two two years later.

The year 1797 is the year of ballads. In his garden house at Jena, Schiller worked diligently at this vein, that perhaps for which he was best suited, and in which he most nearly rivals Goethe. Goethe wrote *Du Braut von Korinth*, *Gott und die Bayadere*, and *Der Zauberlehrling*; and the whole collection was published in the *Musen Almanach* for 1798. The latter half of this year was occupied with a tour in Switzerland. Before its commencement he visited his mother at Frankfurt for the last time, and presented to her his wife and his son. It was a year of extraordinary activity. Besides the ballads and his researches in the morphology of plants and insects, he translated a great part of the autobiography of Benvenuto Cellini, wrote a number of essays on the question of aesthetics, and worked at his long neglected *Faust*. Of this he wrote the dedication, the *Prologue in Heaven*, and the *Golden Marriage of Oberon and Titania*—so powerful was the effect of intellectual sympathy and stimulus. The six years which succeeded Goethe's return from his third Swiss tour, although they embrace the period in which he and Schiller were in daily coöperation, have left us little of permanent worth from the older poet. On the other hand, they are the years of Schiller's greatest activity. The great trilogy of *Wallenstein*, perhaps the highest point of Schiller's genius, was followed by *Maria Stuart*, the *Jungfrau von Orleans*, the *Braut von Messina*, and *Wilhelm Tell*. From the end of 1799 Schiller was permanently settled in Weimar; a dramatic school was founded, and the representation of these classical dramas was the glory of the Weimar stage. During these years Goethe was occupied with *Faust*, with his researches into the theory of colors and of biological development, with the conduct of the theater and the practical encouragement of art. In 1798 the *Horen* died a natural death, and was succeeded by the *Propylæen*, a journal of literature and criticism, which, although it contained many essays by Goethe, never exceeded a circulation of 300. In the spring 1799 the study of Homer incited Goethe to sketch a long epic poem on the subject of Achilles. Schiller did his best to encourage the work. The first canto was rapidly completed, but it had no successor. Goethe contented himself with translating the works of others, and prepared the *Mahomet* and *Tancred* of Voltaire for the Leipsic stage. In the first days of the new century he suffered a dangerous attack of scarlatina. His friends feared for his life. After his recovery he sketched out what was the most important work of these years, a trilogy on the subject of the French Revolution; of this only the first part, the *Natürliche Tochter*, was completed. The play was performed at Weimar on April 2, 1803. Two masterpieces of Schiller—the *Braut von Messina* and the *Jungfrau von Orleans*—preceded and followed it by a few weeks. At the end of this year Madame de Stael arrived in Weimar accompanied by Benjamin Constant. She had heard of the fame of this new Parnassus, and she was bent on proclaiming the intellectual superiority of Germany to the world. Goethe at first fled from her, as Byron did at a later period. He hid himself in Jena, but was recalled by order of the duke. The result of the conversations in the salons of Weimar is contained in her book *De l'Allemagne*. In March she was suddenly recalled by the death of her father, the minister Necker. Goethe was at this time the center to which the most distinguished men of all kinds in Germany

naturally turned. He was most intimate with Zelter the musician, with whom he maintained a full correspondence; with Wilhelm von Humboldt, the statesman-scholar; with F. A. Wolf, the founder of the science of philology; with Gottfried Hermann, the best authority on Greek meters. But the friendship which was worth all these was soon to be severed. In the beginning of 1805 Goethe was convinced that either he or Schiller would die in that year. In January they were both seized with illness; Schiller had finished his *Phædra* and begun to work at his *Demetrius*. Goethe was translating the *Neveu de Rameau* of Diderot. Schiller was the first to recover, and visiting Goethe in his sick room, fell on his neck and kissed him with intense emotion. On April 29th they saw each other for the last time. Schiller was on his way to the theater whither Goethe was too ill to accompany him. They parted at the door of Schiller's house. Schiller died on the evening of May 9th. No one dared to tell Goethe the sad news, but he saw in the faces of those who surrounded him that Schiller must be very ill. On the morrow of Schiller's death, when his wife entered his room, he said, "Is it not true that Schiller was very ill yesterday?" She began to sob. He then cried, "He is dead!" "Thou hast spoken it thyself," she answered. Once more he cried, "He is dead!" and turning aside covered his weeping eyes with his hands. He at first intended to have completed *Demetrius* as a memorial of his friend, but a happier inspiration was to arrange a performance of Schiller's great poem of *The Bell*, and to crown it by an epilogue. Since that time Schiller and Goethe have been inseparable in the minds of their countrymen, and have reigned as twin stars in the literary firmament. If Schiller does not hold the first place, it is at least true that he is more beloved, although Goethe may be more admired. It would be invidious to separate them. But it is evident that the best fruits of Schiller's muse were produced when he was most closely under Goethe's influence, and the foreign student of German culture has ground for believing that at some future time the glory of the lesser luminary will be absorbed in that of the greater, and the name of Goethe will represent alone and unrivaled the literature of his age and country.

Schiller was happy in the occasion of his death. He did not see the troubles which immediately afterward burst upon Thuringia. On October 14, 1806, the battle of Jena was fought. The court had fled from Weimar; only the duchess Louise remained. In the evening of the defeat Weimar was plundered by the conquering troops. Many of Goethe's friends lost everything they possessed. His property and perhaps his life was saved by the firmness of Christiane, and afterward by the billeting of Marshal Augereau in his house. On the 15th Napoleon entered the town, but Goethe did not go to see him. The duchess obtained her husband's pardon by her entreaties. It was not till the autumn of 1808 that Napoleon and Goethe, perhaps the two greatest men then living in Europe, met and conversed. It was at the congress of Erfurt, where the sovereigns and princes of Europe were assembled. Goethe's presence was commanded by the duke. He was attracted at least as much by the prospect of seeing Talma as of meeting Napoleon. He was invited to an audience on October 2d; Talleyrand, Berthier and Savary were present. The emperor sat at a large round table eating his breakfast. He beckoned Goethe to approach him, and said to him, "Vous êtes un homme!" He asked how old he was, expressed his wonder at the freshness of his appearance, said that he had read *Werther* through seven times, and made some acute remarks on the management of the plot. Then, after an interruption, he said that tragedy

ought to be the school of kings and peoples; that there was no subject worthier of treatment than the death of Caesar, which Voltaire had treated insufficiently. A great poet would have given prominence to Caesar's plans for the regeneration of the world, and shown what a loss mankind had suffered by his murder. He invited Goethe to Paris; that was the center of great movements; there he would find subjects worthy of his skill. They parted with mutual admiration. The bust of Napoleon was a prominent ornament in Goethe's study.

In the same year, 1808, an edition of Goethe's works in thirteen volumes was published by Cotta at Tübingen. It is remarkable as containing the first part of *Faust* in its complete form. The principal portion of the drama had already been published as a fragment in 1790. It had then attracted but little attention. Heyne wrote of it: "There are fine passages in it, but with them there are such things as only he could give to the world who takes other men to be blockheads." Wieland and Schiller were apparently dissatisfied with it. It had, perhaps, the appearance of patchwork, as it was made up of fragments which had been written at very different periods of his life. The idea of writing *Faust* seems to have come to Goethe in his earliest manhood. He was brooding over it at the same time with *Götz von Berlichingen*, but at Strasburg he spoke to Herder of neither. He apparently began to write it down at the same time as *Werther*, in 1774, and we find mention of its progress in the two following years; indeed, all the important parts of the fragment which appeared in 1790 were known to Jacobi before 1776. He took the work with him to Italy, where he added little to it except the scene in the witches' kitchen. The dedication, the *Prologue in Heaven*, which presents to the reader the idea of the whole work, the prelude on the stage copied from the Indian drama, the lyrical intermezzo, the scene with Wagner before the city gate, and the scene with Mephistopheles in the study were written before 1800. In that year he was busy with *Helena* for the second part, and he added nothing afterward to the first except the *Walpurgis Night* and the scene of Valentine's death. *Faust* justly stands at the head of all Goethe's works, and it deserves a very high place among the best works of every age. Founded on a well-known popular tale, indebted for its interest and pathos to incidents of universal experience, it deals with the deepest problems which can engage the mind of man. In this combination of qualities it is perhaps superior to any one of Shakespeare's plays. The plot is as simple and as well known to the audience as the plot of a Greek tragedy. The innocence and the fall of Gretchen appeal to every heart; the inward struggles of Faust, like those of Hamlet, and the antagonism of the sensual and moral principles, interest the reader just in proportion as his own mind and nature have been similarly stirred. Each line is made to stand for eternity; not a word is thrown away; the poem has entered as a whole into the mind and thought of modern Germany; nearly every expression has become a household word. Characters are sketched in a single scene; Valentine lives for us as clearly as Faust himself. Deeper meanings are opened up at every reading, and the next age will discover much in it which is concealed from this. Goethe, writing of *Faust* in his eightieth year, says with truth, "The commendation which the poem has received far and near may be, perhaps, owing to this quality, that it permanently preserves the period of development of a human soul which is tormented by all that afflicts mankind, shaken also by all that disturbs it, repelled by all that it finds repellent, and made happy by all that it desires. The author is at present far removed from

such conditions; the world likewise has to some extent other struggles to undergo; nevertheless the state of man, in joy and sorrow, remains very much the same, and the latest born will still find cause to acquaint himself with what has been enjoyed and suffered before him in order to adapt himself to that which awaits him."

In 1809 he finished *Die Wahlverwandschaften* (The Elective Affinities), a story which is always cited to prove the immoral tendency of his works. A married couple, Edward and Charlotte, are thrown into constant companionship with two unmarried persons, the Captain and Ottilie. A cross attraction takes place similar to that which is often seen in chemical experiments. Edward unites himself with Ottilie, Charlotte with the Captain. The psychological changes by which this result is produced are portrayed with a masterly hand. The moral may be held by some to exalt the preponderance of fatality in human affairs, and the uselessness of contending against irresistible circumstances. Others may believe that the story is intended to show the disastrous calamities which may be wrought by a weak and self-indulgent will. Ottilie, though she cannot resist her passion, has strength enough to starve herself to death; Edward is the prototype of Arthur Donnithorne and Tito Melema. The work is replete with earnest purpose and terrible warning.

In 1810 Goethe finished the printing of his *Farbenlehre* (Theory of Colors), a work which had occupied his mind ever since his journey to Italy. His theories were rejected and disregarded by his contemporaries, but he left them with confidence to the judgment of posterity. Goethe's labors in this domain fall into two natural divisions—one in which he tries to prove that the hypotheses of Newton are unsatisfactory, and another in which he promulgates a theory of his own. In his first work, published in 1791 and 1792, he describes with great accuracy and liveliness the experiments which he has made. They consist chiefly of the appearances presented by white discs on a black ground, black discs on a white ground, and colored discs on a black or white ground when seen through a prism. There are two points which he considers fatal to Newton's theory,—that the center of a broad white surface remains white when seen through a prism, and that even a black streak on a white ground can be entirely decomposed into colors. The scientific friends to whom he communicated these observations assured him that there was nothing in them opposed to Newton's theory,—that they were even confirmation of it. He would not be convinced, and took no pains to acquire that exact knowledge of mathematics and geometrical reasoning without which the more abstruse problems of physical optics could not be intelligible. He went on further to formulate a theory of his own. His views on the subject are contained in their shortest form in a letter addressed to Jacobi from the camp at Marienburg in July, 1793. They are divided into six heads, of which the following is an abstract. (1) Light is the simplest matter we have knowledge of, the least capable of analysis, the most homogeneous. It is not a compound body. (2) Least of all is it compounded of colored lights. Every colored light is darker than colorless light. Brightness cannot be compounded of darkness. (3) Inflection, refraction, reflection, are three conditions under which we often observe apparent colors, but they are rather occasions for their appearance than the cause of it. (4) There are only two pure colors, blue and yellow; red may be regarded as a property of both of them. There are two mixed colors, green and purple; the rest are gradations of these colors, and are not pure. (5) Colorless light cannot be produced out of colored lights, nor white from colored pigments. (6) The colors which appear to us arise solely

out of a modification of the light. The colors are excited in the light, not developed out of the light. These views he afterward extended and explained, but very slightly modified. In Goethe's opinion, yellow was light seen through a thickened medium; blue was darkness seen through an illuminated medium; all other colors were derived from these two. The theory of the *Farbenlehre* has not yet received the recognition which Goethe anticipated for it. In his own day he had some adherents,—the most distinguished perhaps was the philosopher Hegel, whose views, however, of natural philosophy have caused many inquirers to recoil from his theory of metaphysics. Goethe complained that no physicist believed in him, and as that is still true in an age which has been devoted more than any other to physical inquiries, we may conclude that the principle upon which his theories are based is radically wrong.

The year 1809, in which *Die Wahlverwandschaften* was written, was for Goethe the beginning of a new era. He was then fresher and brighter than he had been for ten years before. He had lived through a troubled period of oppressive sorrow. The death of Schiller, the violation of his beloved Weimar, the deaths of the duchess Amalia and of his mother, his own bodily and mental sufferings, had given a tone of sadness to his poetry. As if to put the finishing stroke to the efforts of his life, he married the mother of his children, arranged and published his collected works, and completed his theory on colors. The unfinished drama of *Pandora* is a symbol of this time. The part which is completed refers only to past experiences of sadness; the continuation was to have lifted the curtain of future hope.

It was natural at the beginning of a new course of life that Goethe should write an account of his past existence. The study of his collected poems made it apparent to him how necessary it was to furnish a key by which they might be understood. These various causes led to the composition of *Dichtung und Wahrheit* (Poetry and Truth), an autobiographical history of the poet's life from his birth till his settlement at Weimar. This work is the cause of much embarrassment to the poet's biographers. Where it ought to be the most trustworthy source of information, it is most misleading. It is probable that Goethe intended it to be an accurate and circumstantial account of his life. But the inner life of an individual is more clear to him than the outer. The stages of our self-development are better remembered than the exact circumstances which produced them, still less than the order of time in which they followed each other. Goethe took pains to ascertain facts which he had forgotten. But he was so conscious that imagination would play a large part in the composition that in the title he gave poetry the precedence before truth. The indefatigable industry of German investigation has laid open before us every detail of the poet's life and every phase of his feeling. *Dichtung und Wahrheit*, if it has lost its rank as a history, still keeps its place as a classic. The simple loving delineation of the childhood of genius is as fresh as ever, and is of more universal interest from being less particular. The first five books of this autobiography appeared in 1811, the next five in 1812, the third installment at Easter, 1814, and the conclusion after Goethe's death. The period during which this was his principal work witnessed the greatest political event of the first half of our century, the rising of the German people against the power of Napoleon. In this Goethe took no share, and with it he apparently felt little sympathy. He made no impassioned orations to his countrymen like Fichte; he wrote no inspiring lays like Körner. The

ballads which he composed in 1813 are harmless enough, — *Der wandelnde Glocke*, *Der getreue Eckhart*, *Der Todtentanz*. He saw Stein and Arndt at Dresden in 1813, but disappointed them by his impassive manner. The reasons for this apparent coldness are perhaps more simple than they appear at first sight. Goethe was a man of thought rather than of action. Although a fair portion of his long life was given to the practical business of his adopted country, his heart was always in speculation or artistic production. While inspecting mines he was spinning theories of geological formation; while working for the war commission he gladly ran away to the castle of Dornburg to bury himself among his deserted papers. The pressure of court business at Weimar drove him to the solitude of Italy. In the defiles of the Argonne, and in the trenches before Mainz, he was scheming and arranging his theory of colors. A bombardment was valued by him less as an attack upon the enemy than as a series of interesting experiments in optics. Added to this natural indifference to the details of human affairs was his belief in the predominance of force, and in the necessary evolution of the history of the world. Napoleon was to him the greatest living depository of power. Nations, whether conquered or victorious, separated or united, obeyed a common law against which individual will strove in vain. Goethe was thus incapacitated for politics, both by his qualities and his defects. This habit of abstract contemplation grew upon him in later life.

It was hardly to be expected that at the age of sixty-five Goethe should strike out new lines of poetical activity. However, in the *West-östliche Divan*, he made the first attempt to transplant Eastern poetry to a German soil, and set an example which has been followed by Heine and Mirza Schaffy. In 1811 he first became acquainted with the works of Hafiz in Hammer's translation. At a time when North and South and West were splitting in sunder, when thrones were breaking up and empires trembling, he sought a willing refuge in the restoring fountain of the Eastern poet. The book *Timur* has an obvious reference to the expedition of Napoleon in Russia, but the large majority of the poems are amatory, and are addressed to an imaginary Suleika, whose name is given to one of the books. Once more in his old age Goethe came under the sovereignty of a woman. She was Marianne von Willemer, the newly married wife of a Frankfort banker, Jacob von Willemer, who was an old friend of Goethe's and of his brother-in-law Schlosser. Goethe made her acquaintance in a journey which he took in the Rhine country with Sulpiz Boisserée, who had succeeded in interesting Goethe in early German art, a subject to which he was himself devoted. The correspondence between Goethe and Marianne was published in 1877. It extends almost to the day of his death, and includes letters from Eckermann giving an account of his last moments. Not only were most of the *Divan* poems addressed to Suleika, but several of those included in the collection are by Marianne herself, and will bear comparison with those of Goethe. In these poems the Oriental form is not very strictly observed. The fondness of the Orientals for the repetition of single rhymes is not attended to, and if sometimes remembered is soon forgotten. Their Eastern color depends rather on the suggestion of Eastern scenery and the introduction of Eastern names. This, however, gives the poet a greater license to levity, to fatalism, and to passion than would have been possible in poems of a purely German character.

The last twelve years of Goethe's life, when he had passed his seventieth birthday, were occupied by his criticisms on the literature of foreign countries, by the

Wanderjahre, and the second part of *Faust*. He was the literary dictator of Germany and Europe. He took but little interest in the direction in which the younger German school was moving, and was driven to turn his eyes abroad. He conceived an intense admiration for Byron, which was increased by his early death. Byron appears as Euphorion in the second part of *Faust*. He also recognized the greatness of Scott, and was one of the first to send a greeting to the Italian Mazzini. He conceived the idea of a world-literature transcending the narrow limits of race and country, which should unite all nations in harmony of feeling and aspiration. German writers claim that his design has been realized, and the literature of every age and country can be studied in a tongue which Goethe had made rich, flexible, and serviceable for the purpose. The *Wanderjahre*, although it contains some of Goethe's most beautiful conceptions, *The Flight into Egypt*, *The Description of the Pedagogic Province*, *The Parable of the Three Reverences*, is yet an ill-assorted collection of all kinds of writings, old and new.

With the completion of *Faust*, Goethe felt that the work of his life was accomplished. He still continued to work with regularity. He ordered and arranged his writings; he labored at his *Tages- und Jahresheften*, an autobiographical journal of his life. He bated not one jot of heart or hope, and took the liveliest interest in every movement of literature and science. When the news of the July Revolution of 1830 reached Weimar, Goethe was excited beyond his wont, not on account of the triumph of liberal principles, but because the controversy between Cuvier and Geoffroy St. Hilaire had been decided in favor of the latter. Still he had much to darken his latter days. His old friends were falling fast around him. His wife had died in 1816, after a union of thirty years. He felt her loss bitterly. The duchess Amalia had died eight years before, not long after the death of his own mother. He now had to undergo bitter experiences when he was less able to bear them. In June, 1828, he lost the companion of his youth, the grand-duke Karl August, who died suddenly, away from Weimar, on his return from a journey. Goethe received the news with outward calmness, but said, forebodingly, "Now it is all over," and went to mourn and labor at the castle of Dornburg, where everything reminded him of the days of their early friendship. The duchess Louise survived her husband till February, 1830. When Goethe died, in 1832, none of the old Weimar set were left except Knebel, who lived two years longer. A greater blow than these was the death of his only son, whom, in spite of his moral weakness, his father deeply loved. He died at Rome, in October, 1830, and is buried close by the pyramid of Caius Cestius, where Goethe himself once desired to be laid.

We must pass on to the closing scene. On Thursday, March 15, 1832, he spent his last cheerful and happy day. He was visited by the grand-duchess and other friends. He awoke the next morning with a chill. From this he gradually recovered, and on Monday was so much better that he designed to begin his regular work on the next day. But in the middle of the night he woke up with a deathly coldness, which extended from his hands over his body, and which it took many hours to subdue. It then appeared that the lungs were attacked, and that there was no hope of his recovery. Goethe did not anticipate death. He sat fully clothed in his arm-chair, made attempts to reach his study, spoke confidently of his recovery, and of the walks he would take in the fine April days. His daughter-in-law Ottilie tended him faithfully. On the morning of the 22d his strength gradually left him. He sat slumbering in his

arm-chair holding Otilie's hand. Her name was constantly on his lips. His mind occasionally wandered, at one time to his beloved Schiller, at another to a fair female head with black curls, some passion of his youth. His last words were an order to his servant to open the second shutter to let in more light. After this he traced with his forefinger letters in the air. At half-past eleven in the day he drew himself, without any sign of pain, into the left corner of his arm-chair, and went so peacefully to sleep that it was long before the watchers knew that his spirit was really gone. He is buried in the grand-ducal vault, where the bones of Schiller are also laid.

GOETZ, HERMANN, a musical composer, presents one of those instances, too frequent in the history of art, of success long sought for, and cut short by death when achieved at last. He was born at Königsburg in Prussia in 1840, and began his regular musical studies at the comparatively advanced age of seventeen. He entered the music-school of Professor Stern at Berlin, and studied composition chiefly under Ulrich and Hans von Bülow. In 1863 he was appointed organist at Winterthur in Switzerland, where he lived in obscurity for a number of years, occupying himself with composition during his leisure hours. One of his works was an opera, *The Taming of the Shrew*, the libretto skillfully adapted from Shakespeare's play. After much delay it was produced at Mannheim (October, 1874), and its success was as instantaneous as it has up to the present proved lasting. It rapidly made the round of the great German theaters, and spread its composer's fame over all the land. But Goetz did not live to enjoy this happy result for long. In December, 1876, he died at Zurich from overwork.

GOG occurs in two passages of Scripture (Ezek. xxxviii.—xxxix., and Rev. xx) as the name of a great anti-theocratic power destined to manifest itself in the world immediately before the final dispensation is ushered in. In the later passage, Gog and Magog are spoken of as co-ordinate; in the earlier, Gog is given as the name of the person or people, and Magog as that of the land of its origin. Notwithstanding this discrepancy, it is obvious that the passages are intimately related, and that both depend upon Gen. x. 2, where, however, Magog alone is mentioned. Here he is the second son of Japhet, and, on the assumption that a geographical order underlies these ethnographical tables, his locality is to be sought between Gomer and Media or Media. According to Josephus, who is followed by Jerome, the Scythians were primarily intended by this designation; and this opinion has been almost universally accepted in modern times. The name Scythians, it is to be observed, however, is often but a vague word for any or all of the numerous and but partially known tribes of the north; and any attempt to assign a more definite locality to Magog can only be very hesitatingly made. According to some, the Maiotes about the Palus Mæotis are meant; according to others, the Massagetæ; according to Kiepert, the inhabitants of the northern and eastern parts of Armenia. In Ezekiel, Gog is regarded as a terrible ruler in the extreme north, being prince of Rosh, Mesech, and Tubal, as well as governor in the land of Magog, and having the support of Persia, Ethiopia, and Phut, as well as of Gomer and the house of Togarmah. It may be considered as certain that the imagery employed in this prophetic description was suggested by the Scythian invasion which about the time of Isaiah had devastated Asia.

GOGO, or GHOGHÁ, a town in Ahmadábád district, Bombay, 193 miles northwest of Bombay. About three-quarters of a mile east of the town is an excellent anchorage, in some measure sheltered by the island of *Perim*, which lies still further east. The natives of this

are reckoned the best sailors in India; and ships touching here may procure water and supplies, or repair damages.

GOGOL, NIKOLAI VASILIEVICH, was born in the province of Poltava, in South Russia, March 31, 1809. Educated at the Niejin gymnasium, he there started a manuscript periodical, *The Star*, and wrote several pieces, including a tragedy, *The Brigands*. In 1829, he published anonymously a poem called *Italy*, and, under the pseudonym of V. Aloh, an idyll, *Hans Kuchel Garten*, which he had written while still at Niejin. In 1830 he published in a periodical the first of the stories which appeared next year under the title of *Evenings in a Farm near Dikanka: by Rudy Panko*. Between 1830 and 1835 he published his *Arabesques*, a collection of essays and stories; his *Taras Balba*, the chief of the *Cossack Tales* translated into English by George Tolstoy; and a number of novelettes. To the same period belongs his celebrated comedy, the *Revizor*, or Government Inspector. His aim in writing it was to drag into light "all that was bad in Russia," and to hold it up to contempt. And he succeeded in rendering contemptible and ludicrous the official life of Russia, the corruption universally prevailing throughout the civil service, the alternate arrogance and servility of men in office. The play appeared on the stage in the spring of 1836, and achieved a full success, in spite of the opposition attempted by the official classes whose malpractices it exposed. The aim which Gogol had in view when writing the *Revizor* he afterward fully attained in his great novel, *Dead Souls*, the first part of which appeared in 1842. The last works which he published, his *Confession* and *Correspondence with Friends*, offer a painful contrast to the light, bright, vigorous, realistic, humorous writings which had gained and have retained for him his immense popularity in his native land. Asceticism and mystical exaltation had told upon his nervous system, and its feeble condition showed itself in his literary compositions. In 1848 he made a pilgrimage to Jerusalem, and on his return settled down at Moscow, where he died, March 3, 1852, not having quite completed his forty-third year.

GOITER, a term in medicine applied to a swelling in the front of the neck caused by an enlargement of the thyroid gland.

In districts where the disease prevails the goiter usually appears in early life, often from the eighth to the twelfth year. Its growth is at first slow, but after several years of comparative quiescence a somewhat sudden increase is a not unfrequent occurrence. In the earlier stages of the disease the condition of the gland is simply an enlargement of its constituent parts, which retain their normal soft consistence; but in the course of time other changes supervene, and it may become the seat of cystic formations, or acquire hardness from increase of connective tissue or calcareous deposits. Occasionally the enlargement of the gland is uniform, but more commonly one of the lobes, generally the right, is the larger. In some rare instances the disease has been noticed to be limited almost entirely to the isthmus which connects the two lobes of the gland. The growth is unattended with pain, and is not inconsistent with a fair measure of health.

Goiter is a marked example of an endemic disease. There are few parts of the world where it is not found prevailing in certain localities, these being for the most part valleys and elevated plains in mountainous districts. It is noteworthy that goiter can often be cured by removal from the district where it prevails, as also that it is apt to be acquired by previously healthy persons who settle in goiterous localities; and it is only in such places that the disease exhibits any hereditary tendencies.

In the treatment of goiter the first step is the removal, if possible, of the patient from the affected locality, and attention to general hygienic rules. Small and gradual increased doses of iodine, either in the form of iodide of potassium or what is known as Lugol's solution appear to be the best methods of administration. The external application of iodine to the goiter, in the form of liniment or ointment, is of scarcely less value than its internal employment, and would seem to be sometimes capable of effecting a cure alone, as is evident from the method of treatment adopted with singular success in India. This consists in applying to the goiter, by means of a spatula, an ointment of biniodide of mercury for about ten minutes soon after sunrise, and placing the patient with his goiter exposed to rays of the sun for six or seven hours. Blistering of the surface generally follows, a second application of the ointment is made, and the patient sent home. This is often found sufficient to effect the cure.

The name "Exophthalmic Goiter" is applied to another form of enlargement of the thyroid gland, differing entirely in its pathological connections from that above described. In this affection the bronchocele is but one of three phenomena, which together constitute the typical characteristics of the disease, viz., palpitation of the heart and great vessels, enlargement of the thyroid gland, and protrusion of the eyeballs. Although occasionally observed in men, this affection occurs much more commonly in females and in comparatively early life. It is generally preceded by ill health in some form, more particularly impoverishment of blood, and nervous or hysterical disorders, and is occasionally seen in cases of organic heart disease. It has sometimes been suddenly developed as the effect of fright or violent mental emotion. The first of the symptoms to appear is usually the palpitation of the heart, which is aggravated by the slightest exertion, and may be so severe as not only to shake the whole frame but even to be audible at some distance from the patient. An uncomfortable sensation of throbbing is felt throughout the body, and many of the larger blood-vessels are seen to pulsate strongly like the heart. The enlargement of the thyroid gland generally comes on gradually, and rarely increases to any great size, thus differing from true goiter, as originally noticed by Doctor Graves. The enlarged gland is of soft consistence, and communicates a thrill to touch from its dilated and pulsating blood-vessels.

Accompanying the goiter a remarkable change is observed in the appearance of the eyes, which attract attention by their prominence and the startled expression thus given to the countenance. In extreme cases the eyes protrude from their sockets to such a degree that the eyelids cannot be closed, and injury may thus arise to the constantly exposed eyeballs. Apart from such risk, however, the vision is rarely affected in this disease.

In the treatment of exophthalmic goiter the most successful results have been attained by the use of digitalis, which has the effect of giving tone to the heart and contracting the dilated blood-vessels. The tincture of digitalis, in doses of five to ten drops twice or thrice daily, is perhaps the best form of administration. Where anæmia is present iron is indicated, and may be combined with the digitalis, although in some cases it is found to be unsuitable. In allaying the palpitation benefit is said to have frequently followed the application of ice to the cardiac region as well as to the thyroid gland. Iodine, which is so valuable in cases of true goiter, is generally admitted to be of no service in this disease, and is rather held to be injurious.

GOITO, a large village of Italy, in the province of Mantua and district of Volta, situated on the right bank

of the Mincio, about fourteen miles from Castiglione, on the highway between Brescia and Mantua.

GOLCONDA, a fortress and ruined city, situated in the Nizâm's Dominions, seven miles west of Hyderabad city. In former times Golconda was a large and powerful kingdom of the Deccan, which arose on the downfall of the Bâhmâni dynasty, but was subdued by Aurungzebe in 1687, and annexed to the dominions of the Delhi empire. The diamonds of Golconda have obtained great celebrity throughout the world; but they were merely cut and polished here, being generally found at Partial, near the southeastern frontier of the nizâm's territory.

GOLD. The color, luster and power of resisting oxidation, which this metal possesses, have caused it to be valued from the earliest ages. Allusions to gold are frequent in the Old Testament, and the refining of the precious metals by cupellation seems to have been a favorite illustration with the Jewish poets. Jewelry and vessels found in the Egyptian tombs afford evidence of the perfection attained in working gold at a period earlier than the government of Joseph, and drawings on tombs of about this epoch clearly indicate the method of conducting the operations of washing, fusing and weighing the metal. Excavations in Etruria have brought to light beautiful ornaments of gold, enriched with minute grains of the metal, the workmanship of which was unrivaled until Castellani studied and revived the methods employed by Etruscan artists. The Greeks were familiar with natural alloys of silver and gold named *electrum*, rough nuggets of which were frequently stamped, and formed the earliest coins in Lydia. The color of this *electrum* is pale yellow to yellowish white, and it contains from 20 to 40 per cent. of silver.

With regard to the history of the metallurgy of gold, it may be mentioned that, according to Pliny, mercury was employed in his time both as a means of separating the precious metals and for the purposes of gilding. Vitruvius also gives a detailed account of the means of recovering gold, by amalgamation, from cloth into which it had been woven.

Gold is the only metal of a yellow color, which is, however, notably affected by small quantities of other metals; thus the tint is sensibly lowered by small quantities of silver and heightened by copper. The surface color of particles of gold is often apparently reddened by translucent films of brown iron ore. It is nearly as soft as lead. The *hardness* varies, however, with the composition. Crystallized specimens from Oregon and Fraser river, containing respectively 835 and 910 parts of gold in 1,000, are slightly harder than calc spar, but sensibly softer than fluor spar, or much harder than the pure metal. When pure, gold is the most *malleable* of all metals. One grain may be beaten into leaves which cover a surface of fifty-six square inches, and are only $\frac{2}{1000}$ of an inch thick. Faraday has shown that the thickness of gold leaves may be still further reduced by floating them on a dilute solution of cyanide of potassium. When very thin, leaf gold appears yellow by reflected and green by transmitted light. If, however, certain gold films are heated, the light transmitted is ruby red; the pressure of a hard substance on the film so changes its state of aggregation that green light is again transmitted. The metal is extremely *ductile*; a single grain may be drawn into a wire 500 feet in length, and an ounce of gold covering a silver wire is capable of being extended more than 1,300 miles. Gold can readily be welded cold, and thus the finely divided metal, in the state in which it is precipitated from solution, may be compressed between dies into discs or medals. The specific gravity of cast gold varies from 18.29 to 19.37, and by compression between dies

GOLD-MINING.

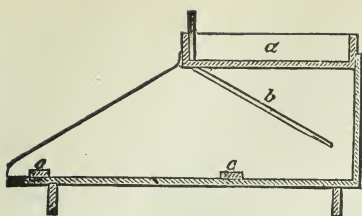


FIG. 1.—Cradle.

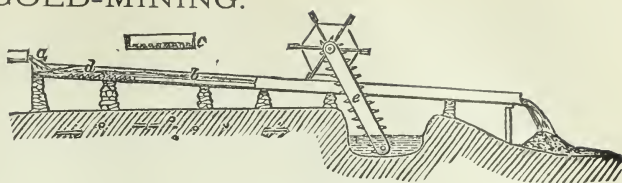


FIG. 2.—Sluice.

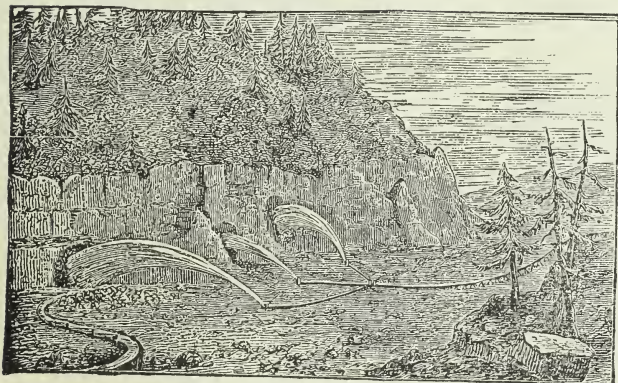


FIG. 3.—Hydraulic Gold Working.

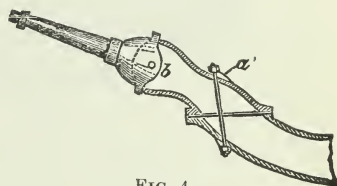


FIG. 4.

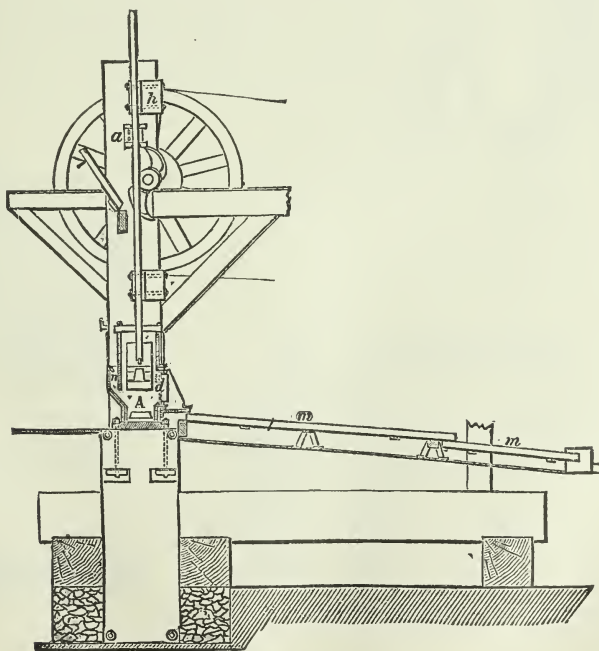


FIG. 5.—Stamp Mill.

GOLD-MINING.

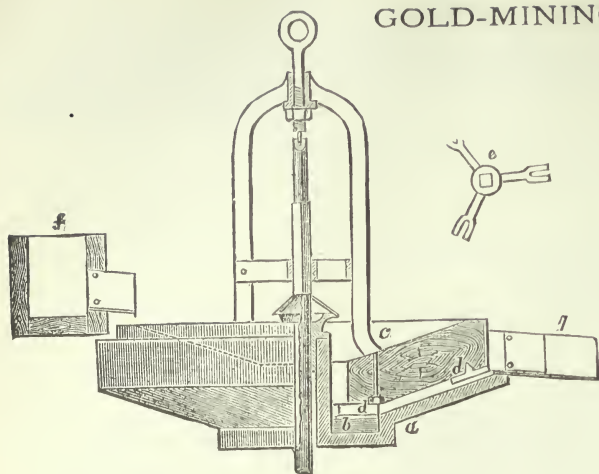


FIG. 6.—Hungarian Mill

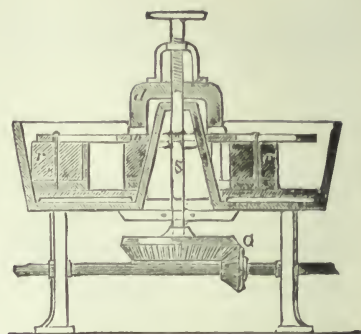


FIG. 7.—Knox Pan.

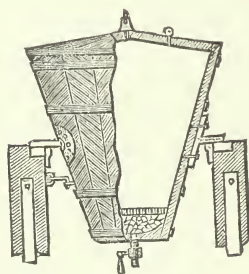


FIG. 8.

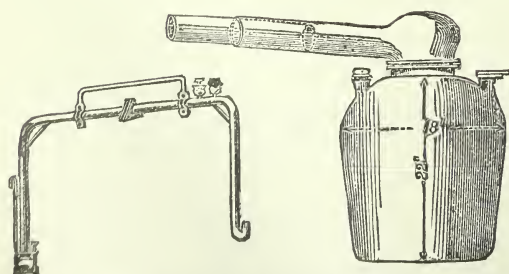
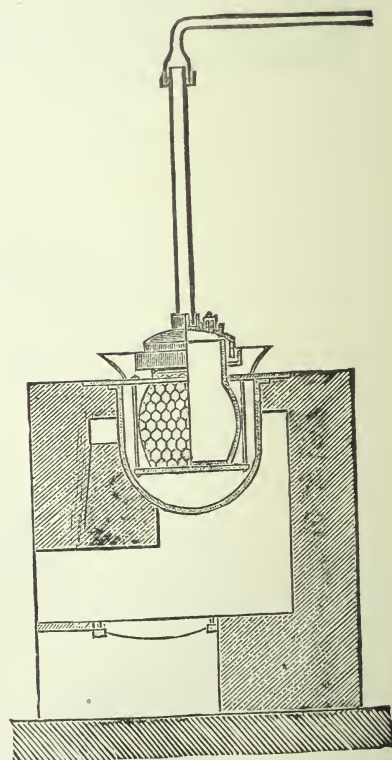


FIG. 9.—Refinery Siphon and Alembic.



the specific gravity may be raised from 19.37 to 19.41; by annealing, however, the previous density is, to some extent, recovered, as it then is found to be 19.40. Different observers have given the following temperatures as its *melting point*:—1425° C. (Daniell), 1200° C. (Pouillet), 1380° C. (Guyton de Morveau). Reimsdijk, after comparing the several results, concludes that it may be considered to be 1240° C.

Finely divided gold dissolves when heated with strong sulphuric acid and a little nitric acid. Dilution with water, however, precipitates the metal as a violet or brown powder from the solution so obtained. Gold is also attacked when strong sulphuric acid is submitted to electrolysis with a gold positive pole.

Gold is found in nature chiefly in the metallic state, or as native gold, and less frequently in combination with tellurium, lead and silver, forming a peculiar group of minerals confined to a few localities in Europe and America. These are the only certain examples of natural combinations of the metal—the minute although economically valuable quantity often found in pyrites and other sulphides being probably only present in mechanical suspension, although for practical purposes it may be spoken of as combined. The native metal occurs tolerably frequently in crystals belonging to the cubic system, the octahedron being the commonest form, but other and complex combinations have been observed. Owing to the softness of the metal, large crystals are rarely well defined, the points being commonly rounded. In the irregular crystalline aggregates branching and moss-like forms are most common, and in Transylvania thin plates or sheets with diagonal structures are characteristic.

Of the minerals containing gold the most important are sylvanite or graphic tellurium, of composition $(\text{AgAu})\text{Te}_2$, with 24 to 26 per cent.; calaverite, AuTe_2 , with 42 per cent.; and nagyagite or foliate tellurium, of a complex and rather indefinite composition, with 5 to 9 per cent. of gold. These are confined to a few localities, the oldest and best known being those of Nagyag and Ofenbanya in Transylvania; but latterly they have been found in some quantity at Red Cloud, Colorado, and in Calaveras county, California—the nearly pure telluride of gold, calaverite, being confined to these places.

The distribution of gold-bearing deposits is worldwide; although the relative importance of different localities is very different; their geological range is also very extensive. In Europe the principal groups of veins are in slaty or crystalline schists, whose age, when it can be determined, is usually Palæozoic, Silurian, Devonian, or Carboniferous, and less commonly in volcanic formations of Tertiary age. The alluvial deposits, being more extensive, are less intimately connected with any particular series of rocks. Few of either are, however, of much importance as compared with the more productive deposits of America and Australia.

On the continent of Europe, the great rivers originating in the crystalline rocks of the Alpine region, such as the Rhine and Danube, are slightly auriferous in their alluvial deposits in several places; but the proportion of gold is extraordinarily minute, so that the working is only carried on by gipsies, or by the local peasantry at irregular intervals, the return for the labor expended being very small. The same remark applies to the Rhone and its affluents, and the rivers of the central granitic mass of France. In the Austrian Alps the gold quartz mines at the Rathausberg, near Gastein, at a height of about 9,000 feet above the sea-level, and at Zell, in Tyrol, are of interest historically, as having developed the system of amalgamation in mills, although they are economically of small importance at present. On the

Italian side, in the Valanzasca and Val Toppa, above Lago Maggiore, a group known as the Pestarena mines have yielded from 2,000 to 3,000 ounces annually for several years past; and more recently a discovery of great interest of a highly auriferous copper ore has been made at Ollomont in the Val d'Aosta. In Hungary, the gold-bearing veins of Schemnitz occur in greenstones and trachytes of Tertiary age, the most powerful example, the *Spitaler-gang*, being filled with a mixture of quartz and brown iron ore, known as zinnopal, and containing gold associated with silver ores, galena, and pyrites. In Transylvania, at Nagyag, the gold-bearing tellurium minerals previously noticed are found in small veins traversing greenstone trachyte. These are often very thin, as low as $\frac{1}{8}$ th to $\frac{1}{16}$ th of an inch, but each is carefully traced out, the rock being impregnated with gold and silver to a certain depth on each side. At Vöroszpaták, another Transylvanian locality, gold, with a very large proportion of silver, and associated with gypsum, is worked in veins traversing a Tertiary sandstone, being almost the only known instance of such a mode of occurrence.

The Russian empire has the largest gold production among the countries of the Old World, most of the produce, however, being derived from its Asiatic territories.

The gold deposits of the Caucasus, though immortalized in the tradition of Jason and the Argonauts, are now entirely abandoned, the last attempt at working them having been suspended in 1875.

On the Atlantic slopes of North America the chief gold-bearing localities are on the Chaudière river, near Quebec, and in Nova Scotia. In both instances the quartz veins worked are contained in slates belonging to the Quebec group of the Lower Silurian period, those of the latter province being specially remarkable for their quasi-stratified character, as they penetrate the slates at a very low angle of inclination, and have been folded and corrugated together with the containing rocks by subsequent disturbances. Other deposits of old geological periods are found in Tennessee and North Carolina.

On the Pacific side of America gold is found under very different conditions, and on a much larger scale than on the Atlantic side. The whole distance from Mexico to Alaska may be said to be more or less auriferous, the most extensive deposits being in the great north-and-south valley of the Sacramento, which runs parallel to the coast, between the so-called Coast Mountains and the Sierra Nevada, the latter being distinguished farther to the north in the Cascade range. Others of less extent are known in the Klamath, Columbia, and Fraser river basins; they extend in the last two far back into the interior, to the region between the Cascade range and the Rocky Mountains. In many of these valleys alluvial deposits are developed to an extent unparalleled elsewhere, the river channels being bordered by banks or benches of gravel and sand, rising in terraces to considerable heights on the flanks of the hills. For example, at the Methow, a tributary of the Columbia, there are sixteen lines of such terraces, the highest about 1,200 feet above the river; and at Colville, on the Columbia, traces of old terraces, much degraded by frost and rain, are seen at 1,500 feet above the river. These gravels, which are of Pliocene and more recent origin, are in many places, though very unequally, auriferous, the richest points being found in the bars or shingle banks of the river after the summer floods, and in the channels of the smaller tributary streams, where the poorer material has been partially enriched by a process of natural washing. The most extensive, or rather the best known because most completely explored, deposits

of this class are those of the Upper Sacramento valley, in California. Others of considerable importance are worked in the Cariboo district on the Upper Fraser river, yielding very coarse gold. Another discovery of a singular character, the produce being a regular gold gravel, was made some years back at Salmon river in Oregon, but the deposit, though exceedingly rich, was soon exhausted. Gold-bearing quartz veins are also common over a large part of California, notably in Grass Valley, in strata that are supposed to be of Triassic age, the associated minerals being iron and arsenical pyrites, galena, etc. In Calaveras county, tellurium ores like that of Transylvania are characteristic of the gold veins. In the adjacent States of Nevada and Colorado, gold is so intimately associated with silver ores that it is for the most part only obtained from the ultimate process of refining the reduced silver. The same remark applies to the most of the mines of Mexico, and on the southwest coast of America, in Peru, Bolivia, and Chili. (See SILVER.)

Very rich gold quartz has been brought from Carabaya, on Lake Titicaca; and considerable deposits, both alluvial and in veins, have been opened at Caratal, in Venezuela, and at St. Elie, in French Guiana, which are interesting as proving the actual existence of Raleigh's Eldorado.

In Brazil the principal gold mines are upon veins in clay slate, and a peculiar class of rocks known as Jacotinga, or Itabirite, and which are mixtures of quartz, chlorite, and specular iron ore, the latter often occurring in large mirror-like crystals several inches across. The gold occurs almost entirely in pyritic minerals, being most abundant in ordinary iron pyrites, and less so in magnetic and arsenical pyrites, free gold being rarely seen.

The gold product of the United States far exceeds that of any other country. We give a tabulated statement of the total production of each State since 1793 to 1900, inclusive, and also the production of each State for the latter year. From the annual report of the director of the mint, December, 1901:

LOCALITY.	GOLD.
Alabama	\$ 274,780
Alaska	9,528,084
Arizona	12,342,826
California	787,459,956
Colorado	86,774,856
Dakota (South)	77,967,560
Georgia	10,023,248
Idaho	41,598,137
Maine	35,703
Maryland	22,285
Michigan	502,691
Minnesota	9,048
Montana	86,025,866
Nevada	43,975,010
New Hampshire	11,501
New Mexico	7,200,491
North Carolina	12,060,523
Oregon	26,849,855
South Carolina	2,788,334
Tennessee	92,581
Texas	11,548
Utah	5,197,916
Vermont	86,958
Virginia	1,789,048
Washington	2,040,307
Wyoming	993,683
Other States or sources	42,204,158
Total unrefined	\$1,257,864,972
Refined bullion	791,989,247
Grand total	\$2,049,854,219

Gold production of the United States during the calendar year 1900:

STATE OR TERRITORY.	GOLD.
Alaska	\$ 8,171,000
Arizona	4,193,400
California	15,816,200
Colorado	28,829,400
Georgia	116,700
Idaho	1,724,700
Michigan	29,000
Montana	4,698,000
Nevada	2,006,200
New Mexico	832,900
North Carolina	28,500
Oregon	1,694,700
South Carolina	121,000
South Dakota	6,177,600
Utah	3,972,200
Washington	718,200
Wyoming	34,200
Alabama, Maryland, Missouri, Tennessee, Texas, and Virginia	7,100
Total (mint director's estimate)	\$ 79,171,000

In India gold is obtained in small quantities by native gold washers in various parts of the highlands of southern Bengal, and more recently quartz veins and alluvial deposits of considerable promise have been discovered in the district of Wynaad, in the southern part of the Madras presidency.

In Africa the chief gold-bearing localities are on the west coast—gold dust derived from alluvial washings, forming an article of export from many of the trading stations along the Guinea coast.

The gold districts of Australia cover a very considerable area, extending from the east side of the continent for about 20° of latitude, the more important deposits being those of Victoria, in the south. The principal districts are in Victoria—Ballarat, Castlemaine and Sandhurst, lying west and north from Melbourne and Beechworth, near the Murray river to the northeast.

Proportion of Gold in Deposits.—A rich gold-bearing deposit is quantitatively very different from one to which the same term is applied when containing ores of other metals. In the latter the useful material must as a rule form a considerable proportion—one or more parts in a hundred—of the mass; while in the former, owing to the superior value of the product, it rarely attains as much as 1 per cent., and is generally very much less, the amount of gold contained in easily worked alluvial deposits being often extremely small.

In vein mining, which is more difficult and costly, a larger yield is necessary, but probably five dwts., or about £1 in value per ton, will in most places represent paying quantities from quartz containing free gold, *i. e.*, not associated with pyrites.

In the less tractable minerals, such as arsenical pyrites occurring in the lower portions of the veins, as much as one and a half to three ounces may be required for profitable working. When associated with the ores of other metals, such as silver, lead and copper, the extraction of the gold is in most cases an incidental and final operation in their metallurgical treatment, and may therefore be best considered in the articles on these metals.

The various deposits of gold may be divided into two classes—"veins" and "placers." The vein mining of gold does not greatly differ from that of similar deposits of metal. It will only be necessary to refer here to certain details of the extraction of gold in such cases. In the placer or alluvial deposits, the precious metal is

round usually in a water-worn condition imbedded in earthy matter, and the method of working all such deposits is based on the disintegration of the earthy matter by the action of a stream of water, which washes away the lighter portions and leaves the denser gold. In alluvial deposits the richest ground is usually found in contact with the "bed rock;" and, when the overlying cover of gravel is very thick, or, as sometimes happens, when the older gravel is covered with a flow of basalt, regular mining by shafts and levels, as in what are known as tunnel-claims, may be required to reach the auriferous ground. In the early days of gold washing in California and Australia, when rich alluvial deposits were common at the surface, the most simple appliances sufficed; the most characteristic being the "pan," a circular dish of sheet iron with sloping sides about thirteen or fourteen inches in diameter. The pan, about two-thirds filled with the "pay dirt" to be washed, is held in the stream or in a hole filled with water. The miner, after separating the larger stones by hand, imparts a gyratory motion to the pan by a combination of shaking and twisting movements which it is impossible to describe exactly, so as to keep its contents suspended in the stream of water, which carries away the bulk of the lighter material, leaving a black residue consisting of magnetic iron ore and other heavy minerals, together with any gold which may originally have been present in the mass. The washing is repeated until enough of the enriched sand is collected, when the gold is finally recovered by careful washing or "panning out" in a smaller pan. In Mexico and South America, instead of the pan, a wooden dish or trough, variously shaped in different districts, and known as "batea," is used.

The "cradle," a simple appliance for treating somewhat larger quantities, varies in length from three feet six inches to seven feet, but the shorter length is that usually adopted. Its nature will be evident from fig. 1, in which *a* is a movable hopper with a perforated bottom of sheet iron in which the "pay dirt" is placed. Water is poured on the dirt, and the rocking motion imparted to the cradle causes the finer particles to pass through the holes in the hopper on to the screen *b*, which is of canvas, and thence to the base of the cradle, where the auriferous particles accumulate on the transverse bars of wood, *c*, called "rifles." Washing by the cradle, which is now but little used except in preliminary workings, is tedious and expensive.

The "tom" is a sort of cradle with an extended sluice placed on an incline of about one foot in twelve. The upper end contains a perforated riddle plate which is placed directly over the riffle box, and under certain circumstances mercury may be placed behind the riffles. Copper plates amalgamated with mercury are also used when the gold is very fine, and even in some instances amalgamated silver coins have been used for the same purpose. Sometimes the stuff is disintegrated with water in a "puddling machine," which is used, especially in Australia, when the earthy matters are tenacious and water scarce. The machine frequently resembles a brickmaker's wash-mill, and is worked by horse or steam power.

In workings on a larger scale, where the supply of water is abundant, as in California, sluices are generally employed. They are shallow troughs about twelve feet long, about sixteen to twenty inches wide and one foot in depth. The troughs taper slightly so that they can be joined in series, the total length often reaching several hundred feet. The incline of the sluice varies with the conformation of the ground and the tenacity of the stuff to be washed, from one in sixteen to one in eight.

Fig. 2 represents one of the simplest forms of sluice

as used in river diggings in the northwest of America. A rectangular trough of boards, whose dimensions depend chiefly on the size of the planks available, is set up on the higher part of the ground at one side of the claim to be worked, upon trestles or piers of rough stone-work, at such an inclination that the stream may carry off all but the largest stones, which are kept back by a grating of boards about two inches apart at *a*. The gravel, which in this particular instance is from twelve to sixteen feet thick, and with an average breadth to the river of twenty-five to thirty feet, is dug by hand and thrown in at the upper end, the stones kept back being removed at intervals by two men with four-pronged steel forks. The floor of the sluice is laid with riffles made of strips of wood two inches square laid parallel to the direction of the current (as at *b*, and in cross section at *c*), and at other points, *d*, with boards having transverse notches filled with mercury. These were known originally as Hungarian riffles. The bottom of the working, which is below the drainage level of the valley, is kept dry by a Chinese bucket pump, *e*, attached to a rough undershot wheel driven by the current in the sluice. The sluice boxes are made in lengths, and united together spigot and faucet fashion, so that they may easily be removed and reerected as the different parts of the claim are progressively exhausted.

In the larger and more permanent erections used in hydraulic mining, the upper ends of the sluices are often cut in rock or lined with stone blocks, the grating stopping the larger stones being known as a "grizzly." In order to save very fine and especially rusty particles of gold, so-called "under-current sluices" are used; these are shallow wooden tanks, fifty square yards and upward in area, which are placed somewhat below the main sluice, and communicate with it above and below, the entry being protected by a grating so that only the finer material is admitted. These are paved with stone blocks or lined with mercury riffles, so that from the greatly reduced velocity of flow, due to the sudden increase of surface, the finer particles of gold may collect. In order to save finely divided gold, amalgamated copper plates are sometimes placed in a nearly level position, at a considerable distance from the head of the sluice, the gold which is retained in it being removed from time to time. Sluices are often made double, and they are usually cleaned up,—that is, the deposit rich in gold is removed from them,—once a week. The gold is then recovered by "panning."

The general appearance of an hydraulic gold working is seen in fig. 3, the water being brought from a ditch on the high grounds, and through a line of pipes to the distributing box, whence the branch pipes supplying the three jets diverge. The stream issues through a nozzle resembling that of a fire engine (fig. 4), which is movable in a horizontal plane around the vertical axis *a*, and in a vertical plane on the spherical joint and center *b*, so that the direction of the jet may be varied through considerable angles by simply moving a handle. The material of the bank, being loosened by the cutting action of the water, crumbles into holes, or "caves in," and the superincumbent mass, often with large trees and stones, falls into the lower ground. The stream, laden with stones and gravel, passes into the sluices, where the gold is recovered in the manner already described.

Under the most advantageous conditions the loss of gold may be estimated at 15 or 20 per cent., the amount recovered representing a value of about half a dollar per ton of gravel treated. The loss of mercury is about the same, from five to six cwt. being in constant use per mile of sluice. About one cwt. is added daily in at least two charges. The average half-yearly

consumption is estimated at about one hundred flasks of seventy-four pounds each, after allowing for the amount recovered in clearing up and distillation of the amalgam. The latter operation is performed at intervals of seven or fourteen days in the upper lengths of the sluice, and half-yearly in the lower parts.

The dressing or mechanical preparation of vein stuff containing gold is generally similar to that of other ores, except that the precious metal should be removed from the waste substances as quickly as possible, even although other minerals of value that are subsequently recovered may be present. This is usually done by amalgamation with mercury. In all cases the quartz or other vein stuff must be reduced to a very fine powder as a preliminary to further operations. This may be done in several ways, *e.g.*, either (1) by the Mexican crusher or *arrastra*, in which the grinding is effected upon a bed of stone, over which heavy blocks of stone attached to cross arms are dragged by the rotation of the arms about a central spindle, motion being furnished by mules or other power, or (2) by the Chilean mill or *trapiche*, also known as the edge-runner, where the grinding stones roll upon the floor, at the same time turning about a central upright—contrivances which are mainly used for the preparation of silver ores; but by far the largest proportion of the gold quartz of California and Australia is reduced by (3) the stamp mill, which is similar in principle to that used in Europe for the preparation of tin and other ores, but has received special modification in many details. Fig. 5 represents the ordinary California pattern of a stamp mill. The stamp is a cylindrical iron pestle faced with a chilled cast-iron shoe, removable so that it can be renewed when necessary, attached to a round iron rod or lifter, the whole weighing from 600 to 800 lbs. The lift is effected by cams acting on the under surface of tappets *a*, and formed by cylindrical boxes keyed on to the stems of the lifter about one-fourth of their length from the top. As, however, the cams, unlike those of European stamp mills, are placed to one side of the stamp, the latter is not only lifted but turned partly round on its own axis, whereby the shoes are worn down uniformly. The bed or mortar *A* is of cast-iron. The height of lift may be between eight and ten inches, and the number of blows from thirty to ninety per minute. The stuff, previously broken to about two inch lumps in a Blake's rock-breaker, is fed in through the aperture *n* at the back of the "battery box," a constant supply of water being given from the channel *b*, and mercury in a finely divided state is added at frequent intervals. The discharge of the comminuted material takes place through the aperture *d*, which is covered by a thin steel plate perforated with numerous slits about $\frac{1}{10}$ inch broad and $\frac{1}{16}$ to $\frac{1}{8}$ inch long, a certain volume being discharged at every blow and carried forward by the flushing water over the apron or table in front, *m*, covered by copper plates filled with mercury. Similar plates are often used to catch any particles of gold that may be thrown back, while the main operation is so conducted that the bulk of the gold may be reduced to the state of amalgam by bringing the two metals into intimate contact under the stamp head, and remain in the battery. The tables in front are laid at an incline of about eight degrees, and are about thirteen feet long; they collect from 10 to 15 per cent. of the whole gold; a further quantity is recovered by leading the sands through a gutter about sixteen inches broad and one hundred and twenty feet long, also lined with amalgamated copper plates, after the pyritic and other heavy minerals have been separated by depositing in catch pits and other similar contrivances.

When the ore does not contain any considerable

amount of free gold, mercury is not, as a rule, used in the battery. The pulverized stuff is received upon blanket tables or sluices. These are inclined boards covered with coarse woolen cloth or sacking. The heavier particles become entangled in the fibers of the cloth, while the lighter deposits are carried forward by the current. At intervals of a quarter to half an hour the surface of the blanket is completely covered, when it is removed, and its contents are washed off in a tub of water and reserved for further treatment. This consists of amalgamation, in a contrivance analogous to the Hungarian mill subsequently described, and subsequent treatment in pan amalgamators somewhat similar to the *arrastra* in character, but with grinding surfaces of iron instead of stone.

At Schemnitz, in Hungary, quartz vein stuffing containing a little gold, partly free and partly associated with pyrites and galena, is, after stamping in mills similar to those described above, but without rotating stamps, passed through the so-called Hungarian gold mill, fig. 6. This consists of a cast-iron pan, *a*, having a shallow cylindrical bottom *b*, holding fifty pounds of mercury, in which a wooden runner *c*, nearly of the same shape as the inside of the pan, and armed below with several projecting blades, is made to revolve by gearing wheels either above, or, as in the figure, below. The connection of the runner with the driving shaft is effected by the three-armed crutch shown in plan at *e*, which sits on the square part of the shaft. By means of set screws analogous to those of a flour mill, the runner is adjusted at such a height that the knives just clear the surface of the mercury. The stuff from the stamps arrives by the gutter *f*, and, falling through the hole in the middle of the runner, is distributed over the mercury, when the gold subsides in virtue of its superdensity, while the quartz and lighter materials are guided by the blades to the circumference, and are discharged at *g*, usually into a second similar mill, and sometimes to a third, placed at lower levels, and subsequently pass over blanket tables. The most advantageous speed is from twelve to fourteen inches per minute. The action of this so-called mill is really more nearly analogous to that of a centrifugal pump, as no grinding action takes place in it. The amalgam is cleaned out about once a month. The average amount of gold collected from fifty tons of stuff stamped is about six ounces in the mills, and in the subsequent dressing processes one pound of auriferous silver and ten hundred weight of lead. According to Ritinger, mercury that has been purified by distillation acts much more rapidly upon gold than such as has been saturated with the metal without losing its fluidity, although the amount that can be dissolved is very small.

There are various forms of pan amalgamators of which space will not permit a description to be given. It may be stated, however, that experience of the great variety of pans that have from time to time been devised has led to the adoption of the more simple forms, in which the grinding is effected between horizontal flat surfaces instead of curved or conical bottoms, and in the pans now usually employed these flat grinding surfaces form an annular floor round a central cone through which a vertical shaft passes. The Knox pan, fig. 7, may be considered to be fairly typical. It is of cast-iron, four feet in diameter and fourteen inches deep. It has a false bottom to form a hollow annular space through which steam can be introduced. The center of the yoke *d* attached to the muller *m*, is keyed to a vertical wrought-iron shaft *S*, two inches in diameter, which can be brought in connection with the driving gear *G*. The blocks *r*, *r* are of wood. In working the pan one hundred pounds of skimmings are introduced, and water added until the pulp will

just adhere to a stick. After three hours' grinding the pulp is heated with steam. About five pounds of mercury are added for every charge, together with a cupful of equal parts of saltpeter and sal ammoniac. After three hours further working, water with a little caustic lime is added, and the pulp is discharged first through an upper and then through a lower hole.

One of the greatest difficulties in the treatment of gold by amalgamation, and more particularly in the treatment of pyrites, arises from the so-called sickening or flouring of mercury; that is, the particles, losing their bright metallic surfaces, are no longer capable of coalescing with or taking up other metals. Of the numerous remedies proposed the most efficacious is perhaps sodium amalgam. It appears that amalgamation is often impeded by the tarnish found on the surface of the gold when it is associated with sulphur, arsenic, bismuth, antimony, or tellurium. Wurtz in America (1864) and Crookes in England (1865) made independently the discovery that, by the addition of a small quantity of sodium to the mercury, the operation is much facilitated. It is also stated that sodium prevents both the "sickening" and the "flouring" of the mercury which is produced by certain associated minerals. Cosmo Newberry has investigated with much care the action of certain metals in impeding amalgamation. Wurtz recommends two amalgams, one containing two and the other four per cent. of sodium, and in practice one per cent. or less of these is added to the mercury in the amalgamator. Crookes employs three kinds, which he calls A, B, and C amalgams; each containing three per cent. of mercury, but the B variety has, in addition to the sodium, twenty per cent. of zinc, and C is mixed with ten per cent. of zinc and ten per cent. of tin. The addition of cyanide of potassium has been suggested to alter the amalgamation and to prevent "flouring," but Skeay has shown that its use is attended with loss of gold.

Separation of Gold from the Amalgam.—The amalgam is first pressed in wetted canvas or buckskin in order to remove excess of mercury. According to Rittinger, mercury will dissolve from 0.05 to 0.08 per cent. of native gold of standard 650 to 850 without loss of fluidity, the solubility of the gold increasing with its fineness; and until the point of saturation is reached, no separation of solid amalgam is possible. Lumps of the solid amalgam, about two inches in diameter, are introduced into an iron vessel lined with a paste of fire-clay and wood ashes, and provided with an iron tube that dips below the surface of water. The distillation is then effected by heating, care being taken that the retort does not become visibly red in daylight. The amalgam yields about 30 to 40 per cent. of gold. In California the amalgam is retorted in cast-iron pans placed in cast-iron cylinders eleven inches in diameter, four feet six inches long, supported on brickwork. The bullion left in the retorts is then melted in black-lead crucibles, with the addition of small quantities of suitable fluxes.

The extraction of gold from auriferous minerals by fusion, except as an incident in their treatment for other metals, is very rarely practiced. It was at one time proposed to treat the concentrated black iron obtained in the Ural gold washings, which consists chiefly of magnetite, as an iron ore, by smelting it with charcoal for auriferous pig-iron, the latter metal possessing the property of dissolving gold in considerable quantity. By subsequent treatment with sulphuric acid the gold could be recovered. Experiments on this point were made by Anossow in 1835, but they have never been followed in practice.

Gold in galena or other lead ores is invariably recovered in the refining or treatment of the lead and

silver obtained. In Colorado the pyritic ores containing gold and silver in association with copper are smelted in reverberatory furnaces for regulus, which, when desilverized by Ziervogel's method, leaves a residue containing twenty or thirty ounces of gold per ton.

Chlorination Process.—Plattner suggested that the residues from certain mines at Reichenstein, in Silesia, should be treated with chlorine after the arsenical products had been extracted by roasting. The process, which depends upon the fact that chlorine acts rapidly upon gold, but does not attack ferric oxide, is now adopted in Grass Valley, California, where the waste minerals, principally pyrites from tailings, have been worked for a considerable time by amalgamation. The roasting is conducted at a low temperature in some sort of reverberatory furnace. Salt is added in the roasting to convert all the metals present, except iron, into chlorides. The auric chloride is, however, decomposed at the elevated temperature into finely divided metallic gold, which is then readily attacked by the chlorine gas. The roasted mineral, slightly moistened, is next introduced into a wooden vat, pitched inside, and furnished with a wooden bottom, as shown in fig. 8. Chlorine is led from a suitable generator beneath the false bottom, and rises through the moistened ore, resting on a bed of broken quartz below the false bottom, converting the gold into a soluble chloride, which is afterward removed by washing with water. The precious metal is then precipitated as metallic gold by sulphate of iron. The process has been greatly improved in America by Küstel, Deetken, and Hoffmann; with proper care it is a very perfect one, and yields ninety-seven per cent. of the gold originally present in the ore. It is stated not to cost more in California than \$12.50 a ton. Any silver originally present in the ore is, of course, converted into chloride of silver and remains with the residue, from which it may be extracted by the solvent action of brine or by amalgamation.

Refining or Parting Gold from other Metals.—Strabo states that in his time a process was employed for refining and purifying gold in large quantities by cementing or burning it with an aluminous earth, which, by destroying the silver, left the gold in a state of purity. Pliny shows that for this purpose the gold was placed on the fire in an earthen vessel with treble its weight of salt, and that it was afterward again exposed to the fire with two parts of salt and one of argillaceous rock, which, in the presence of moisture, effected the decomposition of the salt; by this means the silver became converted into chloride. In a similar process still practiced in New Granada the granulated argentiferous gold is mixed with one part of common salt and two parts of brickdust. In the presence of moisture, effected by the passage of aqueous vapor through the porous pots in which the moisture is heated, the salt acts on the brickdust, producing silicate of soda, and the evolution of hydrochloric acid affords a source of chlorine for the silver. The chloride of silver formed fuses readily and drops off, exposing a fresh surface of the alloy to the action of the gas.

Various methods for separating gold from silver or other alloys appear to have been in use from ancient times. Among these may be mentioned prolonged oxidation by exposure to air, and treatment with sulphur, sulphide of antimony, and corrosive sublimate. In the Harz two ounces of the granulated alloy of gold and silver were mixed and heated with one ounce of sulphur, litharge being added to separate the gold remaining in the sulphide of silver.

Parting by Nitric Acid, the old process of refining, is now practiced in England by only one firm, although

in some refineries both the nitric acid and the sulphuric acid processes are combined, the alloy being first treated with nitric acid. It used to be called "quartation," from the fact that four parts of the alloy best suited for the operation of refining contain three parts of silver and one of gold. The operation may be conducted in vessels of glass or platinum, and each pound of granulated metal is treated with a pound and a quarter of nitric acid of specific gravity 1.32. It is the method employed in the assay of gold. (See ASSAYING.)

Refining by Sulphuric Acid is the process usually adopted for separating gold from silver on the large scale. It appears to have been proposed in France by Dizé at the beginning of the present century. It was actually in use in France in 1820, and was introduced into the Mint refinery, London, by Mr. Mathison in 1829. It is based upon the facts that concentrated hot sulphuric acid converts silver and copper into soluble sulphates without attacking the gold, the sulphate of silver being subsequently reduced to the metallic state by copper plates with the formation of sulphate of copper.

About eighty pounds of the granulated alloy are boiled for three or four hours in the platinum vessel (fig. 9) with 2.5 times its weight of sulphuric acid of specific gravity 1.84. The sulphuric acids which arise are partially condensed before being allowed to pass into the air. When the acid has ceased to act on the metal, a small quantity of sulphuric acid of specific gravity 1.53 is added, and, after a second boiling, the contents of the vessel are allowed to settle. The supernatant liquid is then withdrawn from the gold, which falls to the bottom of the vessel, and is diluted until its density is 1.21 or 1.26. The silver is usually precipitated from solution by copper plates, but sometimes iron is used, and the silver is roughly dried and compressed by an hydraulic press before it is melted into ingots. The gold, which is often again treated with sulphuric acid, is then washed and melted into ingots that contain from 997 to 998 parts of gold in 1,000. The operation of parting may be conducted in iron or platinum vessels; the use of the former was advocated by M. Tocchi, and they are still extensively employed. Magnificent vessels of platinum have, however, been made in England by Messrs. Johnson, Matthey & Co. The alloys best suited for the operation contain from 800 to 950 of silver and 50 to 200 of copper and gold, but the proportion of gold must not exceed 200 parts in 1,000. Refiners obtain alloys in suitable proportions by mixing together auriferous silver and argentiferous gold, the proportions of the respective metals having been previously indicated by assay. By such an arrangement, silver which contains but the 0.0004 part of gold, or 2.25 grains in the troy pound, may be profitably treated.

Cost of Refining.—The charge to the public for refining depends in a great measure on the amount of metal to be operated upon and its richness. In England, however, it may be considered to be about 1d per ounce for the silver and 4d. per ounce for gold. In France the charge is about 90 centimes to 1 franc 25 centimes for a kilogram of silver.

The Lower Harz smelting works produce annually from fifty to fifty-five cwt. of test silver, of an average fineness of 950 silver and 50 gold per 1,000; the proportion of the latter metal is, however, variable, being lowest (3 per 1000) in the silver obtained from the clean lead ores, and highest (10 per 1000) in that separated from argentiferous copper ores—that from the mixed copper and lead ores being of intermediate richness. The silver, in quantities of twenty-five kilograms, is refined upon small tests in a muffle, and when sufficiently purified is granulated by lading it into water, whereby thin flattened granules suitable for dissolving are obtained.

The parting vessels (fig. 10) are of porcelain, which, to protect them against fracture by irregular heating, are covered with wire netting and plastered over with a mixture of clay and smithy scales. They are mounted in a frame, and set loose in an iron pot with a hemispherical bottom, which is heated by a fire from below; the pot also serves to catch the contents of the porcelain vessel if the latter should be accidentally broken. The cover is perforated by a hole in the center for the passage of a lead pipe to carry off the sulphurous acid fumes, and a smaller one at one side through which acid may be introduced. These, as well as other connections on the pipes carrying off the vapors, are secured by water-joints. The charge of about 200 ounces (6.25 kilograms) of granulated silver is treated with twice its weight of sulphuric acid marking 66° Baumé, and, by careful firing, is dissolved in six hours. The proper management of the heat is of importance, as neglect in the conduct of the operation may easily lead to a breakage of the pot. When the charge is completely dissolved the liquid is allowed to settle for some time, and is then poured off into a lead pan, where the silver sulphate solidifies. This, when redissolved by an addition of water and careful warming, is treated with strips of copper, the separation of the silver being facilitated by agitating the liquid. When the latter is found to be completely free from silver the heating is stopped, and the contents of the pan are allowed to settle for eighteen hours, when the copper solution is drawn off by a siphon and sent to the vitriol crystallizers. In the precipitation of 100 kilograms of silver about thirty kilograms of sheet-copper are expended.

The precipitated silver is washed with water in a copper vessel upon a linen filter until the reaction of copper in the washings ceases, and then molded in cylindrical blocks by screw pressure, to express the residual water. These, when fire-dried, are melted in black-lead pots, holding seventy-five lbs., with the addition of a little soda nitre.

The parted gold remaining in the porcelain pot, though already sensibly finer than is usual when iron parting vessels are used, still contains silver, and is therefore boiled once more with sulphuric acid of 66° Baumé. Afterward it is washed with water until silver can be no longer detected in the washings, when it is transferred to a porcelain dish and dried. When a quantity of about ten pounds of gold has been accumulated, it is mixed with a little borax glass, melted in a black-lead pot, and cast. The resulting bars average $\frac{985}{1000}$ fine.

Refining by Chlorine Gas.—F. Bowyer Miller devised in 1867 the following method for separating silver from gold. The process, which is the one now adopted in the Australian mints, consists in converting the silver into chloride by the passage of a stream of chlorine gas through the molten alloy. Clay crucibles are employed after having been saturated with a strong solution of borax and allowed to dry. The chlorine is introduced through the gold by a clay pipe passing to the bottom of the crucible, and connected with the chlorine generator in which the necessary pressure is obtained by a pressure tube eight feet high. The chloride of silver is easily poured off from the surface of the molten metal, and by carefully fusing with a little carbonate of soda, the small amount of gold it retains is separated and falls to the bottom of the crucible. The gold operated upon contains from 3 to 12 per cent. of silver, and the average fineness of the refined gold is 994. The operation is now conducted on a considerable scale in Australia, and in the years 1871 and 1872 no less than 1,100,000 ounces of gold were refined by its aid in Sydney alone. The absolute loss of gold does not exceed fourteen parts in 100,000.

Toughening Brittle Gold.—It will be seen from page 751 that minute traces of certain metals, which do not exceed the $\frac{1}{100}$ part of the mass, render gold brittle and unfit for coinage. Miller showed that the removal of the deleterious metals might be effected by converting them into volatile chlorides by a stream of chlorine gas. The process was introduced into the English mint by Roberts, who successfully treated over 40,000 ounces of brittle gold with but trifling loss of precious metal. Wagner has suggested that bromine may replace chlorine in Miller's process. Brittle gold may also be toughened by throwing a small quantity of corrosive sublimate onto the surface of the molten metal, but this method is wasteful, and the fumes evolved are deleterious. The late Mr. Warington proposed to toughen brittle gold by the addition of about 10 per cent. of black oxide of copper. The process is efficacious, but the crucibles become much corroded and even perforated; the standard fineness of the gold is, moreover, lowered by such copper as is reduced to the metallic state. If gold is but slightly brittle, it may be toughened by pouring it in a thin stream through atmospheric air into a crucible lined with borax, or by the addition of a small quantity of chloride of copper.

Preparation of Pure Gold.—Chemically pure gold may be prepared by several methods. The metal, either in the form of powder or "cornets" from the purest gold that can be obtained, is dissolved in nitro-hydrochloric acid. The excess of acid is driven off, alcohol and chloride of potassium added to precipitate platinum, and the chloride of gold is then dissolved in pure distilled water, the solution being diluted until each gallon does not contain more than half an ounce of the precious metal. The solution is allowed to stand for several weeks, and the supernatant liquid is carefully removed by a siphon from any chloride of silver that may have fallen to the bottom of the vessel. The gold may then be precipitated by a stream of carefully washed sulphurous anhydride, or by the addition of oxalic acid, formic acid, or ferrous sulphate. The spongy gold is washed with dilute hydrochloric acid, distilled water, ammonia water, and again with distilled water, after which it is melted in a clay crucible with a little bisulphate of potash and borax, and poured into a stone mold. Roberts prepared by this method seventy ounces of gold, of which the average purity was 999.96, the precipitant being oxalic acid. Gold precipitated by oxalic acid from an acid solution containing copper is always contaminated with cupric oxalate. E. Purgotti has, however, shown that by heating the solution with the addition of potash, a soluble double oxalate of copper and potash is formed, and the gold is left in the pure state.

It will be convenient to give here, in connection with the article GOLD, rather than in their proper alphabetical place, the articles GOLDBEATING and GOLD LACE.

GOLDBEATING. The art of goldbeating is of great antiquity, being referred to by Homer; and Pliny states that one ounce of gold was extended to 750 leaves, each leaf being four fingers square, which is three times the thickness of the ordinary leaf gold of the present time. In all probability the art originated among Oriental communities, where the working of gold and the use of gold ornaments have been distinguishing characteristics from the most remote periods; and in India goldbeating is still carried on as a craft, involving many mysteries and great difficulties.

The process of goldbeating is thus conducted. The gold, having been alloyed according to the color desired, is melted in a crucible, at a higher temperature than is simply necessary to fuse it, as its malleability is improved by exposure to a greater heat; and sudden cooling does not

interfere with its malleable properties, gold differing in this respect from some other metals. It is then cast into an ingot, and flattened, by rolling between a pair of powerful smooth steel rollers, into a ribbon of one-and-a-half inches wide and ten feet in length to the ounce. After being flattened it is annealed and cut into pieces of about six-and-a-half grains each, or about seventy-five per ounce, and placed between the leaves of a "cutch," which is about half an inch thick and three-and-a-half inches square, containing about 180 leaves of a tough paper manufactured in France. Formerly fine vellum was used for this purpose, and generally still it is interleaved in the proportion of about one of vellum to six of paper. The cutch is beaten on for about twenty minutes with a seventeen-pound hammer, which rebounds by the elasticity of the skin, and saves the labor of lifting, by which the gold is spread to the size of the cutch; each leaf is then taken out, and cut into four pieces, and put between the skins of a "shoder," four-and-a-half inches square and three-fourths of an inch thick, containing about 720 skins, which have been worn out in the finishing or "mold" process. The shoder requires about two hours' beating upon with a nine-pound hammer. As the gold will spread unequally, the shoder is beaten upon after the larger leaves have reached the edges. The effect of this is that the margins of larger leaves come out of the edges in a state of dust. This allows time for the smaller leaves to reach the full size of the shoder, thus producing a general evenness of size in the leaves. Each leaf is again cut into four pieces, and placed between the leaves of a "mold," composed of about 950 of the finest gold-beaters' skins, five inches square and three-quarters of an inch thick, the contents of one shoder filling three molds. The material has now reached the last and most difficult stage of the process; and on the fineness of the skin and the judgment of the workman the perfection and thinness of the leaf of gold depend. During the first hour the hammer is allowed to fall principally upon the center of the mold. This causes gaping cracks upon the edges of the leaves, the sides of which readily coalesce and unite without leaving any trace of the union after being beaten upon. At the second hour, when the gold is about the one-hundred-and-fifty-thousandth part of an inch in thickness, it for the first time permits the transmission of the rays of light. In pure gold, or gold but slightly alloyed, the green rays are transmitted; and in gold highly alloyed with silver, the pale violet rays pass. The mold requires in all about four hours' beating with a seven-pound hammer, when the ordinary thinness for the gold leaf of commerce will be reached. A single ounce of gold will at this stage be extended to $75 \times 4 \times 4 = 1,200$ leaves, which will trim to squares of about three-and-a-quarter inches each. The finished leaf is then taken out of the mold, and the rough edges are trimmed off by slips of the ratan fixed in parallel grooves of an instrument called a wagon, the leaf being laid upon a leathern cushion for that purpose. The sizes to which British leaf is cut are $3 \frac{1}{8}$, $3 \frac{1}{4}$, $3 \frac{1}{2}$, and $3 \frac{3}{4}$ inches. The leaves thus prepared are placed into "books" capable of holding twenty-five leaves each, which have been rubbed over with red ochre to prevent the gold clinging to the paper. The leaf is used for gilding picture-frames, and for other ornamental purposes. (See GILDING.)

GOLD AND SILVER LACE. Under this heading a general account may be given of the use of the precious metals in textiles of all descriptions into which they enter. That these metals were used largely in the sumptuous textiles of the earliest periods of civilization there is abundant testimony; and to this day, in the Oriental centers whence a knowledge and the use of

fabrics inwoven, ornamented and embroidered with gold and silver first spread, the passion for such brilliant and costly textiles is still most strongly and generally prevalent. The earliest mention of the use of gold in a woven fabric occurs in the description of the ephod made for Aaron. In both the *Iliad* and the *Odyssey* distinct allusion is frequently made to inwoven and embroidered golden textiles. Many circumstances point to the conclusion that the art of weaving and embroidering with gold and silver originated in India, where it is still principally prosecuted, and that from one great city to another the practice traveled westward.

The basis of all modern fabrics of this kind is wire, the "gold wire" of the manufacturer being in all cases silver gilt wire, and silver wire being, of course, composed of pure silver. In India the wire is drawn by means of simple draw-plates, with rude and simple appliances, from rounded bars of silver, or gold-plated silver, as the case may be. The wire is flattened into the strip or ribbon-like form it generally assumes by passing it, fourteen or fifteen strands simultaneously, over a fine, smooth, round-topped anvil, and beating it as it passes with a heavy hammer having a slightly convex surface. From wire so flattened there is made in India *soniri*, a tissue or cloth of gold, the web or warp being composed entirely of golden strips, and *ruperi*, a similar tissue of silver. Gold lace is also made on a warp of thick yellow silk with a weft of flat wire, and in the case of ribbons the warp or web is composed of the metal. The flattened wires are twisted around orange (in the case of silver, white) colored silk thread, so as completely to cover the thread and present the appearance of a continuous wire; and in this form it is chiefly employed for weaving into the rich brocades known as kincobs or kinkhabs. Wires flattened, or partially flattened, are also twisted into exceedingly fine spirals, and in this form they are the basis of numerous ornamental applications.

Among the western communities the demand for gold and silver lace and embroideries arises chiefly in connection with naval and military uniforms, court costumes, public and private liveries, ecclesiastical robes and draperies, theatrical dresses, and the badges and insignia of various orders. To a limited extent there is a trade in gold wire and lace to India and China.

GOLDAST, MELCHIOR HAIMINSFELD, an historical writer and collector whose works did great service to the study of the older documents of Germany, was born, January 6, 1576 (or 1578), and died in 1635.

GOLDBERG, a town in the Prussian province of Silesia, capital of a circle and the government district of Liegnitz, is situated fourteen miles southwest of that town, on the Katzbach, an affluent of the Oder.

GOLD COAST, a British colony in Western Africa reconstituted on July 24, 1876, by a royal charter which defines it as consisting of two settlements—(1) the Gold Coast proper, "between the fifth degree of west longitude and the second degree of east longitude; and (2) the settlement of Lagos, similarly comprising all possessions between the second and fifth degrees of east longitude." The charter appoints a governor, establishes a legislative and an executive council, and authorizes the appointment of judges and other legal officers, etc. Both the Gold Coast colony and Lagos had previously been administered by lieutenant-governors dependent on the governor of Sierra Leone. Pop. 1,500,000.

GOLDEN BULL (Latin, *BULLA AUREA*) is, in general, the designation of any charter decorated with a golden seal or *bullæ*, either from the intrinsic importance of its contents, or from the rank and dignity of the bestower or the recipient. But the name has become

practically restricted to a few documents of unusual political importance, the golden bull of the Empire, the golden bull of Brabant, the golden bull of Hungary, and the golden bull of Milan—and of these the first is undoubtedly the golden bull *par excellence*.

It was drawn up under the direction of the emperor Charles IV., and it was formerly ratified in 1356—the first twenty-three chapters by the diet of Nuremberg (January 10th), and the remaining seven by the diet of Metz (December 25th). The exordium is a strangely rhetorical lamentation over the miseries of division, and more especially of a kingdom divided against itself; and the body of the document gives a survey of the duties, privileges, and relations of the various dignitaries of the empire, the emperor, the electors ecclesiastical and secular, the electoral plenipotentiaries, and the officers of the court. As might also be expected, a large place is given to rules of ceremony and etiquette. At first the document was known simply as the *Lex Carolina*; but by and by the name of the book with the Golden Bull came into use, and the present elliptical title was sufficiently established by 1417 to be officially employed in a charter by King Sigismund.

GOLDEN-EYE, a name indiscriminately given in many parts of Britain to two very distinct species of ducks, from the rich yellow color of their irides. The commonest of them—the *Anas fuligula* of Linnæus, and *Fuligula cristata* of most modern ornithologists—is, however, usually called by English writers the Tufted Duck, while "Golden-eye" is reserved in books for the *A. clangula* and *A. glaucion* of Linnæus, who did not know that the birds he so named were but examples of the same species, differing only in age or sex.

The Golden-eye of North America has been by some authors deemed to differ, and has been named *C. americano*, but apparently on insufficient grounds. That country, however, has, in common with Iceland, a very distinct species, *C. islandica*, often called Barrow's Duck, which is but a rare straggler to the continent of Europe. The New World also possesses a third and still more beautiful species of the genus in *C. albeola*, known in books as the Buffet-headed Duck, and to American fowlers as the "Spirit-Duck" and "Butterball."

GOLDEN FLEECE. See ARGONAUTS.

GOLDEN LEGEND. See VORAGINE, JACOBUS DE.

GOLDEN ROSE, an ornament, made of wrought gold and set with gems, which is blessed by the pope on the fourth (Lætare) Sunday of Lent, and usually afterward sent as a mark of special favor to some distinguished individual, church, or civil community.

GOLDFINCH, the *Fringilla carduelis* of Linnæus and the *Carduelis elegans* of later authors, an extremely well-known bird found over the greater parts of Europe and North Africa, and eastward to Persia and Turkestan. Its gay plumage is matched by its sprightly nature, and, together, they make it one of the most favorite cage-birds among all classes. As a songster it is, indeed, surpassed by many other species, but its docility and ready attachment to its master or mistress makes up for any defect in its vocal powers.

GOLDFISH (*Carassius auratus*). In China and the warmer parts of Japan a fish extremely similar to the Crucian carp of Europe is of very common occurrence in ponds and other still waters. In the wild state its colors do not differ from those of a Crucian carp, and, like that fish, it is tenacious of life and easily domesticated. Albinos seem to be rather common, and, as in other fishes (for instance the tench, carp, eel, flounder), the color of most of these albinos is a bright orange or golden yellow; occasionally even this shade of color is lost, the fish being more or less pure white or silvery.

The Chinese have domesticated these albinos for a long time, and, by careful selection, have succeeded in propagating all those strange varieties, and even monstrosities, which appear in every domestic animal. In some individuals the dorsal fin is only half its normal length, in others entirely absent; in others the anal fin has a double spine, in others all the fins are nearly double the usual length. The snout is frequently malformed, giving the head of the fish an appearance similar to that of a bull-dog. The variety most highly prized at present has an extremely short snout, eyes which almost wholly project beyond the orbit, no dorsal fin, and a very long three or four-lobed caudal fin (Telescope-fish). The goldfish is now distributed over nearly all the civilized parts of the world.

GOLD HILL, a town of Storey county, Nevada, United States, is situated at the head of a precipitous ravine of the Nevada mountains, one mile south of Virginia city, and 328 miles east from San Francisco by rail. The name was derived from a small hill connected with the famous Comstock lode, and containing rich golden ore. Some of the most valuable mines of this lode are within the limits of the town, the average yield being about two million dollars monthly in gold and silver. Though there are some quartz mills within the town, the greater part of the ore is conveyed to the mills on Carson river. There is a fine hall in connection with the miners' union, and another has been erected by the Oddfellows and Freemasons. The Methodists, Episcopalians, and Roman Catholics are the principal denominations of the town. Gold Hill obtains its water supply in conjunction with Virginia from the summit of the Sierra Nevada, twenty-five miles distant. Pop. township (1900), 872.

GOLDINGEN, in Lettish **KULDIGA**, a district town of the Russian province of Courland, on the left bank of the Windau, which forms a beautiful waterfall — the Rummel — in the neighborhood.

GOLD LACE. See under **GOLD**.

GOLDONI, CARLO, the most illustrious of the Italian comedy-writers, and the real founder of modern Italian comedy, was born at Venice in 1707. He died in 1793.

GOLDSBORO, a railroad town of Wayne county, N. C. It has some manufactures, and considerable trade with the surrounding country; its banking and telegraph facilities are ample, and its population numbers (1900), 5,877.

GOLDSCHMIDT, HERMANN, a German painter and astronomer, was the son of a Jewish merchant, and was born at Frankfort on June 17, 1802. He died in 1866.

GOLDSMITH, OLIVER, one of the most pleasing English writers of the eighteenth century.

At Pallas Oliver Goldsmith was born in November, 1728. That spot was then, for all practical purposes, almost as remote from the busy and splendid capital in which his later years were passed as any clearing in Upper Canada or any sheep walk in Australasia now is.

While Oliver was still a child his father was presented to a living worth about £200 a year, in the county of West Meath. The family accordingly quitted their cottage in the wilderness for a spacious house on a frequented road, near the village of Lissoy. Here the boy was taught his letters by a maid-servant, and was sent in his seventh year to a village school kept by an old quartermaster on half-pay, who professed to teach nothing but reading, writing, and arithmetic, but who had an inexhaustible fund of stories about ghosts, banshees, and fairies, about the great Rapparee chiefs, Baldearg O'Donnell and galloping Hogan, and about the exploits of Peterborough and Stanhope, the surprise of Monjuich, and the glorious disaster of Brihuega.

From the humble academy kept by the old soldier Goldsmith was removed in his ninth year. He went to several grammar schools, and acquired some knowledge of the ancient languages. His life at this time seems to have been far from happy. He had, as appears from the admirable portrait of him at Knowle, features harsh even to ugliness. The small-pox had set its mark on him with more than usual severity. His stature was small, and his limbs ill put together. Among boys little tenderness is shown to personal defects; and the ridicule excited by poor Oliver's appearance was heightened by a peculiar simplicity and a disposition to blunder, which he retained to the last. He became the common butt of boys and masters, was pointed at as a fright in the playground, and flogged as a dunce in the school-room. When he had risen to eminence, those who had once derided him ransacked their memory for the events of his early years, and recited repartees and couplets which had dropped from him, and which, though little noticed at the time, were supposed, a quarter of a century later, to indicate the powers which produced the *Vicar of Wakefield* and the *Deserted Village*.

In his seventeenth year Oliver went up to Trinity College, Dublin, as a sizar. The sizars paid nothing for food and tuition, and very little for lodging; but they had to perform some menial services from which they have long been relieved. They swept the court, they carried up the dinner to the fellows' table, and changed the plates, and poured out the ale of the rulers of the society. Goldsmith was quartered, not alone, in a garret, on the window of which his name, scrawled by himself, is still read with interest. From such garrets many men of less parts than his have made their way to the woollack or to the episcopal bench. But Goldsmith, while he suffered all the humiliations, threw away all the advantages of his situation. He neglected the studies of the place, stood low at the examinations, was turned down to the bottom of his class for playing the buffoon in the lecture-room, was severely reprimanded for pumping on a constable, and was caned by a brutal tutor for giving a ball in the attic story of the college to some gay youths and damsels from the city.

While Oliver was leading at Dublin a life divided between squalid distress and squalid dissipation, his father died, leaving a mere pittance. The youth obtained his bachelor's degree, and left the university. During some time the humble dwelling to which his widowed mother had retired was his home. He was now in his twenty-first year; it was necessary that he should do something; and his education seemed to have fitted him to do nothing but to dress himself in gaudy colors, of which he was as fond as a magpie, to take a hand at cards, to sing Irish airs, to play the flute, to angle in summer, and to tell ghost stories by the fire in winter. He tried five or six professions in turn without success. He applied for ordination; but, as he applied in scarlet clothes, he was speedily turned out of the episcopal palace. He then became tutor in an opulent family, but soon quitted his situation in consequence of a dispute about play. Then he determined to emigrate to America. His relations, with much satisfaction, saw him set out for Cork on a good horse, with £30 in his pocket. But in six weeks he came back on a miserable hack, without a penny, and informed his mother that the ship in which he had taken his passage, having got a fair wind while he was at a party of pleasure, had sailed without him. Then he resolved to study the law. A generous kinsman advanced £50. With this sum Goldsmith went to Dublin, was enticed into a gaming house, and lost every shilling. He then thought of medicine. A small purse was made up; and in his twenty-fourth year he was sent to Edinburgh.

At Edinburgh he passed eighteen months in nominal attendance on lectures, and picked up some superficial information about chemistry and natural history. Thence he went to Leyden, still pretending to study physic. He left that celebrated university, the third university at which he had resided, in his twenty-seventh year, without a degree, with the merest smattering of medical knowledge, and with no property but his clothes and his flute. His flute, however, proved a useful friend. He rambled on foot through Flanders, France, and Switzerland, playing tunes which everywhere set the peasantry dancing, and which often procured for him a supper and a bed. He wandered as far as Italy.

In 1756 the wanderer landed at Dover, without a shilling, without a friend, and without a calling. He had indeed, if his own unsupported evidence may be trusted, obtained from the university of Padua a doctor's degree; but this dignity proved utterly useless to him. In England his flute was not in request; there were no convents; and he was forced to have recourse to a series of desperate expedients. He turned strolling player; but his face and figure were ill suited to the boards even of the humblest theater. He pounded drugs and ran about London with phials for charitable chemists. He joined a swarm of beggars, which made its nest in Axe Yard. He was for a time usher of a school, and felt the miseries and humiliations of this situation so keenly that he thought it a promotion to be permitted to earn his bread as a bookseller's hack; but he soon found the new yoke more galling than the old one, and was glad to become an usher again. He obtained a medical appointment in the service of the East India Company; but the appointment was speedily revoked. Why it was revoked we are not told. The subject was one on which he never liked to talk. It is probable that he was incompetent to perform the duties of the place. Then he presented himself at Surgeon's Hall for examination, as mate to a naval hospital. Even to so humble a post he was found unequal. By this time the schoolmaster whom he had served for a morsel of food and the third part of a bed was no more. Nothing remained but to return to the lowest drudgery of literature. Goldsmith took a garret in a miserable court, to which he had to climb from the brink of Fleet Ditch by a dizzy ladder of flagstones called Breakneck Steps. The court and the ascent have long disappeared, but old Londoners well remember both. Here, at thirty, the unlucky adventurer sat down to toil like a galley slave.

In the succeeding six years he sent to the press some things which have survived, and many which have perished. He produced articles for reviews, magazines, and newspapers; children's books, which, bound in gilt paper and adorned with hideous woodcuts, appeared in the window of the once far-famed shop at the corner of Saint Paul's Churchyard; *An Inquiry into the State of Polite Learning in Europe*, which, though of little or no value, is still reprinted among his works; a *Life of Beau Nash*, which is not reprinted, though it well deserves to be so, a superficial and incorrect, but very readable, *History of England*, in a series of letters purporting to be addressed by a nobleman to his son; and some very lively and amusing *Sketches of London Society*, in a series of letters purporting to be addressed by a Chinese traveler to his friends. All these works were anonymous; but some of them were well known to be Goldsmith's; and he gradually rose in the estimation of the booksellers for whom he drudged. He was, indeed, emphatically a popular writer.

As his name gradually became known, the circle of his acquaintance widened. He was introduced to Johnson, who was then considered as the first of living English writers; to Reynolds, the first of English paint-

ers; and to Burke, who had not yet entered parliament, but had distinguished himself greatly by his writings and by the eloquence of his conversation. With these eminent men Goldsmith became intimate. In 1763 he was one of the nine original members of that celebrated fraternity which has sometimes been called the Literary Club, but which has always disclaimed that epithet, and still glories in the simple name of the Club.

By this time Goldsmith had quitted his miserable dwelling at the top of Breakneck Steps, and had taken chambers in the more civilized region of the Inns of Court. But he was still often reduced to pitiable shifts. Toward the close of 1764 his rent was so long in arrear that his landlady one morning called in the help of a sheriff's officer. The debtor, in great perplexity, dispatched a messenger to Johnson; and Johnson, always friendly, though often surly, sent back the messenger with a guinea, and promised to follow speedily. He came, and found that Goldsmith had changed the guinea, and was railing at the landlady over a bottle of madeira. Johnson put the cork into the bottle, and entreated his friend to consider calmly how money was to be procured. Goldsmith said that he had a novel ready for the press. Johnson glanced at the manuscript, saw that there were good things in it, took it to a bookseller, sold it for £60, and soon returned with the money. The rent was paid; and the sheriff's officer withdrew. According to one story, Goldsmith gave his landlady a sharp reprimand for her treatment; to him; according to another, he insisted on her joining him in a bowl of punch. Both stories are probably true. The Novel which was thus ushered into the world was the *Vicar of Wakefield*.

But before the *Vicar of Wakefield* appeared in print, came the great crisis of Goldsmith's literary life. In Christmas week, 1764, he published a poem, entitled the *Traveller*. It was the first work to which he had put his name, and it at once raised him to the rank of a legitimate English classic. The opinion of the most skillful critics was that nothing finer had appeared in verse since the fourth book of the *Dunciad*. In one respect the *Traveller* differs from all Goldsmith's other writings. In general his designs were bad, and his execution good. In the *Traveller*, the execution, though deserving of much praise, is far inferior to the design.

While the fourth edition of the *Traveller* was on the counters of the booksellers, the *Vicar of Wakefield* appeared, and rapidly obtained a popularity which has lasted down to our own time, and which is likely to last as long as our language.

The success which had attended Goldsmith as a novelist emboldened him to try his fortune as a dramatist. He wrote the *Goodnatured Man*, a piece which had a worse fate than it deserved. Garrick refused to produce it at Drury Lane. It was acted at Covent Garden in 1768, but was coldly received. The author, however, cleared by his benefit nights, and by the sale of the copyright, no less than £500, five times as much as he had made by the *Traveller* and the *Vicar of Wakefield* together.

In 1770 appeared the *Deserted Village*. In mere diction and versification this celebrated poem is fully equal, perhaps superior, to the *Traveller*; and it is generally preferred to the *Traveller* by that large class of readers who think, with Bayes in the *Rehearsal*, that the only use of a plan is to bring in fine things.

In 1773 Goldsmith tried his chance at Covent Garden with a second play, *She Stoops to Conquer*. The manager was, not without great difficulty, induced to bring this piece out. The sentimental comedy still reigned, and Goldsmith's comedies were not sentimental. The *Goodnatured Man* had been too funny to succeed; yet the mirth of the *Goodnatured Man* was sober when compared with the rich drolletry of *She Stoops to Con-*

quer, which is, in truth, an incomparable farce in five acts. On this occasion, however, genius triumphed. Pit, boxes, and galleries were in a constant roar of laughter. If any bigoted admirer of Kelly and Cumberland ventured to hiss or groan, he was speedily silenced by a general cry of "turn him out," or "throw him over." Three generations have since confirmed the verdict which was pronounced on that night.

While Goldsmith was writing the *Deserted Village* and *She Stoops to Conquer*, he was employed on works of a very different kind, works from which he derived little reputation but much profit. He compiled for the use of schools a *History of Rome*, by which he made £300; a *History of England*, by which he made £600; a *History of Greece*, for which he received £250; a *Natural History*, for which the booksellers covenanted to pay him 800 guineas. These works he produced without any elaborate research, by merely selecting, abridging, and translating into his own clear, pure, and flowing language, what he found in books well known to the world, but too bulky or too dry for boys and girls. He committed some strange blunders, for he knew nothing with accuracy.

Yet, ignorant as Goldsmith was, few writers have done more to make the first steps in the laborious road to knowledge easy and pleasant. His compilations are widely distinguished from the compilations of ordinary bookmakers. He was a great, perhaps an unequalled, master of the arts of selection and condensation.

Goldsmith might now be considered as a prosperous man. He had the means of living in comfort, and even in what to one who had so often slept in barns and on bulks must have been luxury. His fame was great and was constantly rising. He lived in what was intellectually far the best society of the kingdom, in a society in which no talent or accomplishment was wanting, and in which the art of conversation was cultivated with splendid success. There probably were never four talkers more admirable in four different ways than Johnson, Burke, Beauclerk and Garrick; and Goldsmith was on terms of intimacy with all the four. He aspired to share in their colloquial renown, but never was ambition more unfortunate. It may seem strange that a man who wrote with so much perspicuity, vivacity and grace should have been, whenever he took a part in conversation, an empty, noisy, blundering rattle. But on this point the evidence is overwhelming. So extraordinary was the contrast between Goldsmith's published works and the silly things which he said, that Horace Walpole described him as an inspired idiot.

His associates seem to have regarded him with kindness, which, in spite of their admiration of his writings, was not unminged with contempt. In truth, there was in his character much to love, but very little to respect.

Goldsmith has sometimes been represented as a man of genius, cruelly treated by the world, and doomed to struggle with difficulties, which at last broke his heart. But no representation can be more remote from the truth. He did, indeed, go through much sharp misery before he had done anything considerable in literature. But after his name had appeared on the title-page of the *Traveller*, he had none but himself to blame for his distress. His average income, during the last seven years of his life certainly exceeded £400, and £400 a year ranked, among the incomes of that day, at least as high as £800 a year would rank at present. A single man living in the Temple, with £400 a year, might then be called opulent. Not one in ten of the young gentlemen of good families who were studying the law there had so much. But all the wealth which Lord Clive had brought from Bengal, and Sir Law-

rence Dundas from Germany, joined together, would not have sufficed for Goldsmith. He spent twice as much as he had. He wore fine clothes, gave dinners of several courses, paid court to venal beauties. He had also, it should be remembered, to the honor of his heart, though not of his head, a guinea, or five, or ten, according to the state of his purse, ready for any tale of distress, true or false. But it was not in dress or feasting, in promiscuous amours or promiscuous charities, that his chief expense lay. He had been from boyhood a gambler, and at once the most sanguine and the most unskillful of gamblers. For a time he put off the day of inevitable ruin by temporary expedients. He obtained advances from booksellers, by promising to execute works which he never began. But at length this source of supply failed. He owed more than £2,000; and he saw no hope of extrication from his embarrassments. His spirits and health gave way. He was attacked by a nervous fever, which he thought himself competent to treat. It would have been happy for him if his medical skill had been appreciated as justly by himself as by others. Notwithstanding the degree which he pretended to have received at Padua, he could procure no patients. Goldsmith now, in spite of the example of others, took his own medicine. The remedy aggravated the malady. The sick man was induced to call in real physicians; and they at one time imagined that they had cured the disease. Still his weakness and restlessness continued. He could get no sleep. He could take no food. "You are worse," said one of the medical attendants, "than you should be from the degree of fever which you have. Is your mind at ease?" "No; it is not," were the last recorded words of Oliver Goldsmith. He died on April 3, 1774, in his forty-sixth year. He was laid in the churchyard of the Temple; but the spot was not marked by any inscription, and is now forgotten. The coffin was followed by Burke and Reynolds. Both these great men were sincere mourners. Burke, when he heard of Goldsmith's death, had burst into a flood of tears. Reynolds had been so much moved by the news that he had flung aside his brush and palette for the day.

GOLDSTÜCKER, THEODOR, an eminent Sanskrit scholar, was born of Jewish parents at Königsberg on January 18, 1821, and died in 1872.

GOLF (in its older forms GOFF, GOUFF, or GOWFF, the last of which gives the genuine old pronunciation) is an amusement so peculiar to Scotland and so prevalent there that—unless curling may be held to dispute the place with it—it may be called, *par excellence*, the national game. There seems little doubt the word is derived from the German *kolbe*, a club—in Dutch, *kolf*,—which last is nearly in sound identical, and might give inference for the game of a Dutch origin.

Golf may be practiced on any good stretch of meadowland, where the grass is not too rank; but the ground best suited for the purpose is a reach of undulating down-country, such as is common on the seaboard,—sandy in soil, and as such covered with a short crisp turf, occasionally broken up by sandholes or "bunkers," and provided, in addition, with a fair supply of gorse or whin. These "bunkers" and whins constitute the main "hazards" of the game, in the avoidance of which skill in it is specially shown; and without a fair provision of them, no golfing "links" or "green" can be held to approach the ideal standard. Small holes, of about four inches diameter, are punched in the turf at distances indefinitely variable, but ranging from 100 to 400 or 500 yards; and from one of these holes into the next in order, a ball of gutta percha of about one and three fourths ounces has to be driven with implements (clubs) of some variety devised for the purpose.

Their variety is determined by this, that while, in starting from the hole, the ball may be *teed* (i.e., placed where the player chooses, with a little pinch of sand under it called a *tee*), it must in every other case be played strictly from its place as it chances to lie,—in sand, whin, or elsewhere,—a different club being necessary in each particular difficulty. These clubs may generally be defined as shafts of wood, with so-called *heads* of wood or iron attached. Starting from the one hole, it is the immediate aim of the player to drive his ball as far toward the next as he can. Having got within some moderate distance of it, he proceeds to make his "approach shot," carefully selecting the appropriate implement. When he has reached the "putting green,"—a smooth space carefully chosen for the purpose,—he essays to put (or putt) his ball into the hole; and generally, if he does it in two strokes, he may be held skillful or fortunate. The player who holes his ball in the smallest number of strokes is, as matter of course, winner of the hole.

GOLGOTHA, "the place of a skull," the scene of the crucifixion of the Savior. Why it was called "the place of a skull" has been keenly debated, whether from the skulls of criminals lying about there, or from its being a round, bare, skull-like hillock. The latter is probably the true explanation; though none of the Evangelists offers any warranty for the current phrase, "*Mount Calvary*." It lay outside and north of the city of Jerusalem.

GOLIUS, JACOBUS, Orientalist, was born at the Hague in 1596, and died in 1667.

GOLLNOW, a town in the Prussian province of Pomerania, government district of Stettin, is situated on the right bank of the Ilna, fourteen miles north-northeast of Stettin, with which it has communication by steamer.

GÖLNITZ, or GÖLLNITZ, a mining town of Hungary, on a river of the same name, in the county of Szepes (Zips). Gölnitz was formerly a royal free town; its chief importance now is as a mining center.

GOLOVNIN, VASILY MIKHAILOVICH, a Russian vice-admiral, was born April 20, 1776, and died July 12, 1831.

GOLTZ, BOGUMIL, humorist and satirist, was born of a German family settled at Warsaw March 20, 1881, and died in 1870.

GOLTZIUS, HENDRIK, a Dutch painter and engraver, was born in 1558 at Mûlebrecht, in the duchy of Juliers, and died in 1617. His portraits, though mostly miniatures, are master-pieces of their kind, both on account of their exquisite finish, and as fine studies of individual character. Of his larger heads, the life-size portrait of himself is probably the most striking example.

GOMARUS, FRANCIS, a professor of theology at Leyden, was born at Bruges on January 30, 1563, and died in 1641.

GOMBROON, another name for BENDER-ABBASI (q.v.).

GOMER, the eldest son of Japhet, and an ally of Gog, has usually, since Calmet's time, been identified with those Cimmerii who, originally inhabiting the districts to the northeast and north of the Black Sea and Sea of Azoff, at an early period began to penetrate as far as Asia Minor, and, in the seventh century B.C., overran Lydia, though without leaving permanent traces of their presence. This identification, however, is to be met with in none of the older writers. Josephus understands the Galatians of northern Phrygia to be intended, and Gimmeri or Gamir was, in the language of the ancient Armenians, a usual designation for their neighbors, the Cappadocians.

GONDA, a district of Oudh, bounded on the north by the lower range of the Himalayas, on the east by Basti district, on the south by Fyzabad and Bara Banki, and on the west by Bharach, and having an area of 2,824 square miles.

GONDA, the chief town and administrative headquarters of Gonda district. The site on which the town now stands was originally a jungle, in the center of which was a cattle fold (Gontha or Gothán), in which the cattle were inclosed at night as a protection against wild beasts, and from this the town derived its name.

GONDAR, properly GUENDAR, a town of Abyssinia, formerly the capital of the Amharic kingdom, is situated on a basaltic ridge in the country of Dembea, about twenty-one miles northeast of Lake Tsana or Tana, a splendid view of which is obtained from the castle.

GONDOKORO. See ISMAILIA.

GONDWANA, a tract of country in Central India, extending from the 19th to the 25th degree N. latitude, deriving its name from the aboriginal tribes of *Gonds*, who form the predominant element in the population. The tract may be considered as comprising part of the British territory of Ságor and Nerbudda, with the districts of Singrauli, Chotá Nágpur and Sirguja, the petty native states on the southwest frontier of Bengal, the Cuttack Mahals, and the northern portion of Nágpur. It is estimated to be 400 miles in length by 280 in average breadth.

GONG (Chinese, *gong-gong* or *tam-tam*), a sonorous or musical instrument of Chinese origin and manufacture, made in the form of a broad thin disk with a deep rim. Gongs vary in diameter from about twenty to forty inches, and they are made of bronze containing a maximum of twenty-two parts of tin to seventy-eight of copper; but in many cases the proportion of tin is considerably less. The gong is beaten with a round, hard, leather-covered pad, fitted on a short stick or handle. It emits a peculiarly sonorous sound, its complex vibrations bursting into a wave-like succession of tones, sometimes shrill, sometimes deep.

GONGORA Y ARGOTE, LUIS DE, Spanish lyric poet, was born at Cordova, on July 11, 1561, and died in 1627.

GONIOMETER. Strictly speaking this name is applicable to any instrument, such as a mural circle, a theodolite, and so on, used for measuring an angle; it is in reality, however, applied exclusively to instruments used for measuring the angles between the faces of crystals. (See SPECTROSCOPE.)

GONSALVO. See GONZALO.

GONZAGA, or GONZUGUE, an old princely family of Italy, which traces its origin to the emperor Lothair, but first came into notice in the eleventh century, after the overthrow of the imperial power in Italy, where they for some time disputed the sovereignty of Mantua with the Bonacosse. The long dispute was ended by the murder of Passerino de Bonacossi in 1328, after which the Gonzaga retained possession of Mantua for four centuries.

GONZAGA, THOMAZ ANTONIO (809), "the Portuguese Petrarch," perhaps better known as DIRCEU, was born at Oporto in 1744, and died in 1809.

GONZALO DE BERCEO, mystic and didactic poet, and one of the earliest names in Castilian literature, was parish priest at Berceo, near San Domingo de la Calzada, in the province of Burgos, and lived, it is believed, during the first sixty years of the Thirteenth century.

GONZALO FERNANDEZ Y AGUILAR, commonly known as Gonsalvo de Cordova, El Gran Capitán ("The Great Captain"), was born at Montilla on March 16, 1453, and died in 1515.

GOOD, JOHN MASON, a writer on medical, religious, and classical subjects, was born May 25, 1764, at Epping, Essex, and died January 2, 1827.

GOOD FRIDAY, the usual English name for the day observed throughout a great part of Christendom as the anniversary of the passion and death of Christ.

The origin of the custom of a yearly commemoration of the crucifixion is involved in some obscurity. It may be regarded as certain, indeed, that among Jewish Christians it almost imperceptibly grew out of the old habit of annually celebrating the Passover on the 14th of Nisan, and of observing the "days of unleavened bread," from the 15th to the 21st of that month. In the Gentile churches, on the other hand, it seems to be well established that originally no yearly cycle of festivals was known at all. The weekly observance of the dies dominica, however, became universal at a very early date; and the practice of giving special prominence to Easter Sunday (the first Sunday after the 14th of Nisan), as well as that of keeping a previous fast of considerable rigor, though of indeterminate duration, had established itself in Egypt and in the Western churches at least by the middle of the second century.

From the earliest period of its observance, the day was marked by a specially rigorous fast, and also, on the whole, by a tendency to greater simplicity in the public services of the church.

GOODRICH, SAMUEL GRISWOLD, an American author better known under the pseudonym of Peter Parley, was the son of a Congregational minister, and was born at Ridgefield, Connecticut, August 19, 1793. He was a prolific writer. He died in 1860.

GOODSIR, JOHN, anatomist, born at Anstruther, Fife, Scotland, March 20, 1814; died in 1867.

GOODWIN, THOMAS, a prominent English divine of the later Puritan period, was born at Rollesby, Norfolk, on October 5, 1600, and died in 1679.

GOOJERAT. See GUJARAT.

GOOLE, a market town and river-port of England, West Riding of Yorkshire, is situated on the right bank of the Ouse, twenty-five miles west of Hull, on the Hull and Doncaster Railway, and at the eastern terminus of the Wakefield, Pontefract, and Goole branch of the Lancashire and Yorkshire Railway.

GOOSANDER. See MERGANSER.

GOOSE, the general English name for a considerable number of birds, belonging to the Family *Anatide* of modern ornithologists, which are mostly larger than Ducks and less than Swans. Technically the word Goose is reserved for the female, the male being called Gander.

The most important species of Goose, and the type of the genus *Anser*, is undoubtedly that which is the origin of our well-known domestic race, the *Anser ferus* or *A. cinereus* of most naturalists, commonly called in English the Gray or Gray Lag Goose, a bird of exceedingly wide range in the Old World, apparently breeding where suitable localities are to be found in most European countries from Lapland to Spain and Bulgaria. Eastward it extends to China, but does not seem to be known in Japan. The domestication of this species, as Mr. Darwin remarks, is doubtless of very ancient date, and yet scarcely any other animal that has been tamed for so long a period, and bred so largely in captivity, has varied so little. It has increased greatly in size and fecundity, but almost the only change in plumage is that tame Geese lose the browner and darker tints of the wild bird, and are invariably more or less marked with white — being often indeed wholly of that color. The most generally recognized breeds of domestic Geese are those to which the distinctive names of Emden and Toulouse are applied; but a singular breed,

said to have come from Sebastopol, was introduced into Western Europe about the year 1856. In this the scapulars are elongated, curled and spirally twisted, having their shaft transparent, and so thin that it often splits into fine filaments, which, remaining free for an inch or more, often coalesce again.

In North America there is only one species of typical Goose, and that belongs to the white—"nailed" group. It very nearly resembles *A. albifrons*, but is larger, and has been described as distinct under the name of *A. gambeli*.

But the New World possesses by far the greatest wealth of Anserine forms. Besides others, presently to be mentioned, its northern portions are the home of all the species of Snow-Geese belonging to the genus *Chen*. It is true that two of these are reported as having appeared, and that not unfrequently, in Europe and Asia; but they possibly have been but stragglers from America. The first of these, the Snow-Goose proper, is a bird of large size, and when adult of a pure white, except the primaries, which are black.

The southern portions of the New World are inhabited by about half a dozen species of Geese, akin to the foregoing, but separated as the genus *Chloephaga*. The most noticeable of them are the Rock or Kelp Goose, and the Upland Goose. In both of these the sexes are totally unlike in color, the male being nearly white, while the female is of a mottled brown, but in others a greater similarity obtains. Very nearly allied to the birds of this group, if, indeed, that can be justifiably separated, comes one which belongs to the northern hemisphere, and is common to the Old World as well as the New. It contains the Geese which have received the common names of Bernacles or Brents, and the scientific appellations of *Bernicla* and *Branta* — for the use of either of which much may be said by nomenclaturists. All the species of this section are distinguished by their general dark, sooty color, relieved in some by white of greater or less purity, and, by way of distinction from the members of the genus *Anser*, which are known as Gray Geese, are frequently called by fowlers Black Geese. Of these, the best known, both in Europe and North America, is the Brent-Goose, a truly marine bird, seldom (in Europe, at least), quitting salt-water. It is known to breed in Spitsbergen and in Greenland. A form which is, by some ornithologists, deemed a good species, and called by them *B. nigricans*, occurs chiefly on the Pacific coast of North America. In it the black of the neck, which, in the common Brent, terminates just above the breast, extends over most of the lower parts. The true Bernacle-Goose is but a casual visitor to North America, but is said to breed in Iceland, and occasionally in Norway. Its usual breeding-places, however, still form one of the puzzles of the ornithologist, and the difficulty is not lessened by the fact that it will breed freely in semi-captivity, while the Brent-Goose will not. From the latter the Bernacle-Goose is easily distinguished by its larger size and white cheeks. Hutchins' Goose seems to be its true representative in the New World. In this the face is dark, but a white crescentic or triangular patch extends from the throat on either side upward behind the eye. Almost exactly similar in coloration to the last, but greatly superior in size, and possessing eighteen rectrices, while all the foregoing have but sixteen, is the common wild Goose of America, which, for some two centuries or more, has been introduced into Europe, where it propagates so freely that it has been included by nearly all the ornithologists of this quarter of the globe, as a member of its fauna. An allied form, by some deemed a species, is *B. leucopareia*, which ranges over the western part of North America, and, though

having eighteen rectrices, is distinguished by a white collar round the lower part of the neck.

The largest living Goose is that called the Chinese, Guinea, or Swan-Goose, and it seems to be the stock whence the domestic Geese of several Eastern countries have sprung. It may not unfrequently be seen in English farmyards, and it is found to cross readily with our common tame Goose, the offspring being fertile, and Blyth has said that these crosses are very abundant in India. The true home of the species is in Eastern Siberia or Mongolia.

GOOSEBERRY, *Ribes grossularia*, a well-known fruit-bush of northern and central Europe, usually placed in the same genus of the natural order to which it gives name as the closely allied currants, but by some made the type of a small sub-genus, *Grossularia*, the members of which differ from the true currants chiefly in their spinous stems, and in their flowers growing on short footstalks, solitary, or two or three together, instead of in racemes.

The wild gooseberry is a small, straggling bush, nearly resembling the cultivated plant—the branches being thickly set with sharp spines, standing out singly or in diverging tufts of two or three from the bases of the short spurs or lateral leaf shoots, on which the bell-shaped flowers are produced, singly or in pairs, from the groups of rounded, deeply-crenated three or five lobed leaves. The fruit is smaller than in the garden kinds, but is often of good flavor; it is generally hairy, but in one variety smooth, constituting the *R. uva-crispa* of writers; the color is usually green, but berries are occasionally met with having deep purple berries.

The varieties are most easily propagated by cuttings planted in the autumn, which root rapidly, and in a few years form good fruit-bearing bushes. Much difference of opinion prevails regarding the mode of pruning this valuable shrub; it is probable that in different situations it may require varying treatment. The fruit being borne on the lateral spurs, and on the shoots of the last year, it is the usual practice to shorten the side branches in the winter, before the buds begin to expand; some reduce the longer leading shoots at the same time, while others prefer to nip off the ends of these in the summer while they are still succulent. When large fruit is desired, plenty of manure should be supplied to the roots, and the greater portion of the berries picked off while still small.

The gooseberry was introduced into the United States by the early settlers, and in some parts of New England large quantities of the green fruit are produced and sold for culinary use in the towns; but the excessive heat of the American summer is not adapted for the healthy maturation of the berries, especially of the English varieties. Perhaps if some of these, or those raised in the country, could be crossed with one of the indigenous species, kinds might be obtained better fitted for American conditions of culture, although the gooseberry does not readily hybridize. The bushes are apt to be infested by a minute fly, known as the gooseberry midge, which lays its eggs in the green fruit, in which the larvæ are hatched, causing the berries to turn purple, and fall prematurely.

The gooseberry, when ripe, yields a fine wine by the fermentation of the juice with water and sugar, the resulting sparkling liquor retaining much of the flavor of the fruit. By similarly treating the juice of the green fruit, picked just before it ripens, an effervescing wine is produced, nearly resembling some kinds of champagne, and, when skillfully prepared, far superior to much of the liquor sold under that name. Brandy has been made from ripe gooseberries by distillation; by exposing the

juice with sugar to the acetous fermentation a good vinegar may be obtained. The gooseberry, when perfectly ripe, contains a large quantity of sugar, most abundant in the red and amber varieties; in the former it amounts to from 6 to upward of 8 per cent. The acidity of the fruit is chiefly due to malic acid.

GOPHER (*Testudo gopher*, Bartr.), the only living representative on the North American continent of the family of land tortoises, where it occurs in the south-eastern parts of the United States, from Florida in the south to the river Savannah in the north. Its carapace, which is oblong and remarkably compressed, measures from thirteen to fourteen inches in extreme length, the shields which cover it being grooved, and of a yellow-brown color. The gopher abounds chiefly in the forests, but occasionally visits the open plains, where it does great damage, especially to the potato crops, on which it feeds. It is a nocturnal animal, remaining concealed by day in its deep burrow, and coming forth at night to feed. Its strength, in proportion to its size, is said to be enormous, it being able, according to Dumeril and Bibron, to move along comfortably bearing a man on its back. The flesh of the gopher or mungofa, as it also called, is considered excellent eating.

GÖPPINGEN, a town of Württemberg, circle of the Danube, on the right bank of the Fils, twenty-two miles east-southeast of Stuttgart. Pop. (1900), 19,384.

GORAKHPUR, a district of the Northwestern Provinces, India, bounded on the north by the territory of Nepal, on the east by Champaran and Saran, on the south by the Gogra river, and on the west by Basti and Fyzabad, with an area of 4,578 square miles. The district lies immediately south of the lower Himalayan slopes, but forms itself a portion of the great alluvial plain.

GORAKHPUR, a municipal city, and the administrative headquarters of Gorakhpur district, Northwestern Provinces, on the river Rápti, near the center of the district. Pop. (1901), 63,059.

GORAMY, or GOURAMY (*Osphronemus olfax*), is reputed to be one of the best-flavored freshwater fishes in the East Indian archipelago. Its original home is Java, Sumatra, Borneo, and several other East Indian islands, but thence it has been transported to and acclimatized in Penang, Malacca, Mauritius, and even Cayenne. Being an almost omnivorous fish and tenacious of life, it seems to recommend itself particularly for acclimatization in other tropical countries; and specimens kept in captivity become as tame as carps. It attains the size of a large turbot. Its shape is flat and short, the body covered with large scales; the dorsal and anal fins are provided with numerous spines, and the ventral fins produced into long filaments.

GORCUM, or GORKUM (Dutch, *Gorinchem*), a town of the Netherlands, chief town of a circle in the province of South Holland, twenty-two miles east-southeast of Rotterdam, on the right bank of the Merve or Merwede, at the influx of the Linge, by which it is intersected.

GORDIANUS, or GORDIAN, the name of three Roman emperors. The first, Marcus Antonius Africanus Gordianus, the wealthiest of the Romans, was descended on the father's side from the Gracchi, on the mother's from Trajan, while his wife was the granddaughter of Antonius Pius. While he gained unbounded popularity by his magnificent games and shows, his prudent and retired life did not alarm the tyranny of Caracalla. Alexander Severus called him to the dangerous honors of government in Africa, and, during his consulship there, occurred the usurpation of Maximin. The universal discontent roused by the oppressive rule of Maximin culminated in a revolt in Africa in 238, and Gordian reluctantly yielded to the popular clamor, and

assumed the purple. His son was associated with him in the dignity. The senate confirmed the choice of the Africans, and most of the provinces gladly sided with the new emperors; but, even while their cause was so successful abroad, they had fallen before the sudden inroad of Capellianus, who commanded Mauretania in the interest of Maximin. They had reigned only thirty-six days. Both the Gordians had deserved, by their amiable character, their high reputation; they were men of great accomplishments, fond of literature, and voluminous authors; but they were rather intellectual voluptuaries than able statesmen or powerful rulers. Having embraced the cause of Gordian, the senate was obliged to continue the revolt against Maximin, and appointed Maximus and Balbinus, two of its noblest and most esteemed members, as joint emperors. At their inauguration a sedition arose, and the popular outcry for a Gordian was appeased by the association of M. Antonius Gordianus Pius, nephew of the younger and grandson of the elder Gordian, a boy of thirteen. Maximin forthwith invaded Italy, but was murdered by his own troops while besieging Aquileia; and a revolt of the prætorian guards, to which Maximus and Balbinus fell victims, left Gordian sole emperor. He was slain by his soldiers in 244.

GORDIAN KNOT. The origin of this famous knot was as follows: Gordius, a Phrygian peasant, was once plowing in his fields, when an eagle settled on his yoke of oxen, and remained till the end of the day. A prophetess of Telmessus advised him to sacrifice to Zeus. He did so, and out of gratitude married the prophetess, by whom he had a son, Midas. When Midas grew up, disturbances broke out in Phrygia, and the people sent messengers to Delphi, to ask about choosing a new king. The messengers were informed that a king would come to them riding on a car, and that he would restore peace. Gordius, with his father, very opportunely arrived in the requisite manner. He was elected king, whereupon he dedicated his car and yoke to Zeus, in the acropolis, the knot of the yoke being tied in so skillful a manner, that an oracle declared whoever should unloose it would be ruler of all Asia. When Alexander the Great came, he cut the knot with his sword.

GORDIUM, an ancient town of Bithynia, was situated not far from the River Sangarius, but the site has not been exactly ascertained, though M. Lejean believes that it may be identified with ruins which he observed in the vicinity of the village Emret. According to the legend, Gordium was founded by a certain Gordius, who had been called to the throne by the Phrygians in obedience to an oracle of Zeus commanding them to select the first person that rode into the agora in a car. Gordius reigned many years and raised Phrygia to an important position.

GORDON, ALEXANDER, the "Sandy Gordon" of Scott's *Antiquary*, is believed to have been a native of Aberdeen, and a graduate of either King's or Marischal College, but of his parentage and early history nothing is known. When still a young man he is said to have traveled abroad, probably in the capacity of tutor. He must, however, have returned to Scotland previous to 1726, when, betaking himself to antiquarian pursuits, he made the acquaintance of, among others, Roger Gale, the first vice-president of the Society of Antiquaries. In the year just mentioned appeared the *Itinerarium Septentrionale*, his greatest and best known work.

GORDON, LORD GEORGE, third and youngest son of Cosmo George, duke of Gordon, was born in London, 1751. After completing his education at Eton, he entered the navy, where he rose to the rank of lieutenant; but on account of a disagreement regarding promotion

with Lord Sandwith, then at the head of the admiralty, he resigned his commission shortly before the commencement of the American war. In 1774 he entered parliament as a member for the small borough of Luggershall, and possessing some wit, great ease of address, and the confidence arising from sincere conviction, he advocated his individual notions on any subject with great volubility and with something of the eagerness of monomania. After supporting the ministry for some time, he began to attack both ministry and opposition with such ceaseless pertinacity that it became a common saying that "there were three parties in parliament—the ministry, the opposition, and Lord George Gordon." He vehemently opposed the passing of the acts for the removal of the Roman Catholic disabilities, and took a leading part in organizing the Protestant associations of Scotland and England. Of both associations he was chosen president, and, on June 2, 1780, he headed the mob which marched in procession from St. George's Fields to the houses of parliament in order to present the monster petition against the acts. After the mob reached Westminster, a terrific riot ensued, which continued several days, during which the city was virtually at their mercy. At first, indeed, they dispersed after threatening to make forcible entry into the house of commons, but reassembled soon afterward and destroyed several Roman Catholic chapels, pillaged the private dwellings of many Roman Catholics, set fire to Newgate and broke open all the other prisons, attacked the Bank of England and several other public buildings, and continued the work of violence and conflagration until the interference of the military, by whom no fewer than 450 persons were killed and wounded before the riots were quelled. For his share in instigating the riots, Lord Gordon was apprehended on a charge of high treason; but, mainly through the skillful and eloquent defense of Erskine, he was acquitted on the ground that he had no treasonable intentions. In 1786 he was excommunicated by the archbishop of Canterbury for refusing to bear witness in an ecclesiastical suit; and, in 1787, he was convicted of libeling the queen of France, the French ambassador, and the administration of justice in England. He was however, permitted to withdraw from the court without bail, and made his escape to Holland; but on account of representations from the court of Versailles he was commanded to quit that country, and, returning to England, was apprehended, and, in January, 1788, was sentenced to five years' imprisonment in Newgate, where, after refusing to grant the guarantees required as a condition of his obtaining his liberty, at the conclusion of his original term of imprisonment, he died of delirious fever in 1793. Some time before his apprehension he had become a convert to Judaism, and had undergone the initiatory rite.

GORDON, SIR JOHN WATSON, Scottish painter, was born in Edinburgh in 1788 and died in 1864.

John Watson Gordon was one of the earlier members of the Royal Scottish Academy and was elected its president in 1850; he was at the same time appointed limner to her majesty for Scotland, and received the honor of knighthood. Since 1841 he had been an associate of the Royal Academy, and in 1851 he was elected a Royal Academician. Sir John continued to paint with little if any diminution of power until within a very few weeks of his death, which occurred on June 1, 1864.

GORDON, PATRICK, of Auchleuchries, a Russian general, was descended from a Scotch family of Aberdeenshire. He was born in 1635, and died November 29, 1699. The czar, who had made him general-in-chief of the Russian army, visited him frequently during his illness, was with him when he died, and with his own hands closed his eyes.

GOE, MRS. CATHERINE GRACE, an exceedingly prolific English novelist, was born in 1799 at East Retford, Nottinghamshire, and died in 1861.

GOREE (in French *Gorée*, and in the native tongue *Bir* or *Berr*, that is, a belly, in allusion to its shape), a small island off the west coast of Africa, belonging to the French colony of the Senegal. Goree is a free port, and forms a convenient center for the distribution of European goods.

GORGAS of Leontini, in Sicily, a rhetorician and sophist of whose personal history nothing is known beyond the facts that in 427, when already a comparatively old man, he was sent by his fellow-citizens at the head of an embassy to ask Athenian protection against the aggression of the Syracusans; that he then settled in Athens, and supported himself by the practice of oratory and by teaching rhetoric; and that he ended his days at Larissa, in Thessaly. His birth and death may be approximately dated respectively at 483 and 375 B.C.

GORGON. In Grecian mythology, Gorgo is always the impersonation of the atmospheric terrors, and is conceived in connection with the deities that are armed with thunder and lightning—Zeus and Athene. With Athene in particular is the connection very close, and some facts of ritual and nomenclature almost suggest an original identity of the two.

GORI, in Georgia, an ancient fortress, is now the chief town of a district of the same name in the government of Tiflis, and a station on the Poti-Tiflis railroad.

GORILLA. See APE.

GÖRITZ. See GÖRZ.

GÖRLITZ, a town in the Prussian province of Silesia, capital of a circle in the government district of Liegnitz, is situated on the left bank of the Neisse, and at the junction point of several railways, fifty-five miles east of Dresden. Population (1900), 80,932.

GÖRRES, JOSEPH JOHANN, a distinguished controversialist and writer on religious, political, and scientific subjects, was born January 25, 1776, at Coblenz, and died in 1848.

GORTSCHAKOFF (GORCHAKOV), a noble Russian family, descended from Michael Vsevolodovich, prince of Chernigoff, who, in 1246, was assassinated by the Mongols. Several members of this family have taken prominent parts in the military, political and social events of the Russian empire. (See vol. VII.)

GORTYNA, or GORTYN, an important ancient city on the southern side of the island of Crete. It was, next to Cnossus, the largest and most powerful city of Crete. The two cities combined to subdue the rest of the island; but when they had gained their object, they quarreled with each other, and the history of both towns is from this time little more than a record of their feuds.

GÖRZ, with GRADISCA, is one of the crown-lands of the Austrian monarchy, bounded north by Carinthia, east by Carniola, Istria and the Triestine territory, south by the Triestine territory and the Adriatic and west by Italy. On all sides, except toward the southwest where it unites with the Friulian lowland, it is surrounded by mountains, and four-sixths at least of its area of 3,075 square miles is occupied by mountains and hills. From the ridge of the Julian Alps, which rise in an almost unbroken line to a height of 6,000 or 7,000 feet, the country descends in successive terraces toward the sea, and may roughly be divided into the upper highlands, the lower highlands, the hilly district, and the lowlands. Population, 647,943.

GÖRZ, GORTZ, or GORIZ, the chief town of the crown land, is beautifully situated in the fruitful valley of the Isonzo, twenty-five miles north-northwest of Trieste by railway. It is the seat of an archbishop, of a circle court, and of a head tax office. Population, 23,000.

GOS-HAWK, i.e. Goose-Hawk, the *Astur palumbarius* of ornithologists, and the largest of the short-winged Hawks used in Falconry. Its English name, however, has possibly been transferred to this species from one of the long-winged Hawks, or true Falcons, since there is no tradition of the Gos-Hawk, now so called, having ever been used in Europe to take Geese or other large and powerful birds. The genus *Astur* may be readily distinguished from *Falco* by the smooth edges of its beak, its short wings (not reaching beyond about the middle of the tail), and its long legs and toes—though these last are stout and comparatively shorter than in the Sparrow-Hawks. In plumage the Gos-Hawk has a general resemblance to the Peregrine Falcon (see FALCON), and it undergoes a corresponding change as it advances from youth to maturity—the young being longitudinally streaked beneath, while the adults are transversely barred. The irides, however, are always yellow, or in old birds orange, while those of the Falcons are dark brown. The sexes differ greatly in size.

GOSHEN (גֹּשֶׁן), or the land of Goshen, a territory of Egypt in which the Israelites were settled from Jacob's immigration to the Exodus. In the Septuagint the equivalent is usually the land Gesem, but in Gen. xiv. 10 "the land Gesem of Arabia," Arabia being here either the Arabian nome or the extreme east of Lower Egypt.

GOSHEN, Orange County, N. Y., is the capital of the county, and is situated in the midst of a rich dairy region. It is noted for its trade in butter and dairy products. It has cheese and other manufactories, railroad and telegraph facilities, banks, churches, etc., and a population of (1900) 2,826.

GOSHEN, the county seat of Elkhart County, Ind., is a railroad center of some importance. Its water power is utilized in extensive manufactories of various kinds. It has good banking, telegraph and educational facilities. Its population numbered (1900), 7,810.

GOSLAR, a town in the district of Hildesheim, Prussia, province of Hanover, is situated on the Gose, an affluent of the Ocker, at the foot of the Harz, twenty-four miles southeast of Hildesheim. It is surrounded by walls, and has a very antique appearance.

GOSLICKI, WAWRZYNIEC, a learned Pole, better known under his Latinized name of Laurentius Grimalius Goslicius, was born about 1533. He was also a strenuous advocate of religious toleration in Poland. He died October 31, 1607.

GOSPELS, SYNOPTICAL GOSPELS, of the four canonical Gospels (*god*, God or good; *spell*, discourse or tidings). The first three (differing from the fourth) agree in narrating nearly the same events in somewhat similar language, and are hence called synoptical. It will be advantageous to begin with the treatment of these, as to their origin, date, and objects, so far as can be determined from (1) internal evidence and (2) external evidence.

Internal Evidence.

In discussing the internal evidence, it will be convenient to speak, first, of those portions of the synoptic narrative which are found in three Gospels; then of those which are found in only two; and, lastly, of those which are found in only one.

The Triple Tradition.—Few are aware of the very small extent to which independent narrators of the same events use the same words. A comparison of a few specimens of independent narratives (of such events, for example, as the attempt to assassinate King Humbert, or the death of the French Prince Imperial) would show

that the narratives often contain scarcely two or three consecutive words in common, and rarely or never a whole clause of five or six words. The same statement applies to narratives of discourses of any length reported from memory, and not from notes taken at the moment. Now it is well known that in many parts of the first three gospels the same words and phrases are curiously interlaced, in such a way as to suggest that the writers have borrowed either from each other or from some common source. For example, in describing the healing of the sick (Matt. viii. 16; Mark i. 32; Luke iv. 40), Matthew begins thus; *ὁψίας δὲ γενομένης* (opsias dè genoménēs), when the evening was come; Mark, *ὁψίας δὲ γενομένης ὅτε ἐδύσεν ὁ ἥλιος* (opsias dè genoménēs hóte édysen ho hélios), and at evening, when the sun had set; Luke, *δύνοντος δὲ τοῦ ἡλίου* (dynontos dè toú hēliou), when the sun was setting. From this and many similar passages it might seem natural to infer that Mark borrowed one of these expressions from Matthew and the other from Luke, and that the narrative of Mark is little more than a combination of passages from Matthew and Luke. This is an inference which has actually been drawn by many critics both before and since De Wette; but at present it finds comparatively little support among competent investigators. However, the oscillations of New Testament criticism have been so numerous that it may be of use to indicate a method by which the originality of Mark may be established on an immovable basis. That Mark (at all events in many parts) contains the original document or tradition from which Matthew and Luke have borrowed can be proved to demonstration by a necessary inference from a specimen of narrative common to the three writers. (See Matt. xxi. 33-44; Luke xx. 9-18; Mark xii. 1-11.)

It will be observed in the extracts referred to, that (up to verse eleven of Mark), besides the matter common to all three writers, Mark and Luke have a good deal of additional matter in common; Mark and Matthew have also much additional matter in common; but, in striking contrast, Matthew and Luke have no additional matter in common, except that in verse three of Mark they insert *οἱ γεωργοί* for clearness; in verse seven they insert *ἰδόντες*; and in verse nine they insert *οὖν*. Are these facts compatible with the theory that Mark compounded his narrative out of Matthew and Luke?

We may begin by dismissing the three trifling words which Matthew and Luke agree in adding to the Triple Tradition (by which we mean the matter common to the three Gospels), as being words that any early editor of Mark might naturally insert. The insertion of the subject in verse three, for clearness, requires no comment. The *οὖν* in verse nine softens an abruptness which (however characteristic of Mark) would naturally repel readers and editors. Again, in verse seven the omission of some phrase to denote that the husbandmen saw the son approaching before they formed their plan, is so abrupt that *ἰδόντες* or *θεασάμενοι* has been actually supplied in Mark by several manuscripts and versions (possibly, of course, influenced by Matthew and Luke), and might naturally be supplied by still earlier editors. Having therefore accounted for these words, we are led to this result, that, from Mark xii. 1 to Mark xii. 11, Matthew and Luke contain nothing in common which is not also found in a slightly modified edition of Mark. This being the case, it can be proved by *reductio ad absurdum* that Mark did not copy from Matthew and Luke. For suppose that he did so copy, it follows that he must not only have constructed a narrative based upon two others, borrowing here a piece from Matthew and here a piece from Luke, but that he must

have deliberately determined to insert, and must have adapted his narratives so as to insert, every word that was common to Matthew and Luke. The difficulty of doing this is enormous, and will be patent to any one who will try to perform a similar literary feat himself. To embody the whole of even one document in a narrative of one's own, without copying it *verbatim*, and to do this in a free and natural manner, requires no little care. But to take two documents, to put them side by side and analyze their common matter, and then to write a narrative, graphic, abrupt, and in all respects the opposite of artificial, which shall contain every phrase and word that is common to both — this would be a *tour de force* even for a skillful literary forger of these days, and may be dismissed as an impossibility for the writer of the Second Gospel.

The question remains, Were Matthew and Luke entirely dependent upon Mark for that part of their narrative which covers the same ground as Mark? It would not be difficult, from a comparison of the three citations above, to make it probable that Matthew and Luke did not borrow from the complete Mark as we have it. For though each of the three additions *οὖν*, *ἰδόντες*, *οἱ γεωργοί* is in itself natural enough, yet the hypothesis that Matthew and Luke independently adopted precisely these and no other additions is most improbable. From a comparison of many such passages the improbability of the borrowing hypothesis might be increased.

What then was the original tradition upon which our three synoptic Gospels are based? Was it Aramaic or Greek? oral or written? single or manifold? Did the earliest of our synoptists receive it fresh from its first source, or after it had passed through many recensions? Few or none of these questions (to some of which reference will be made hereafter) can be answered with absolute certainty; but it is evident that, if Matthew, Mark, and Luke are all based upon an earlier original tradition, then those words and phrases which are common to Matthew, Mark, and Luke (to which we have given the name of the Triple Tradition) must have a peculiar weight, as approximating to the original tradition itself. If it be found that these scattered words and phrases make up of themselves an almost continuous narrative, we may fairly suppose that we are approximating very closely indeed to the original tradition. We shall not expect to find a perfectly continuous narrative. On the contrary, a perfectly continuous narrative, identical in Matthew, Mark, and Luke, would imply, not a floating early variable tradition but a document simply copied by the authors of our Gospels.

An early tradition, circulated perhaps in various churches, in Antioch, in Rome, in Ephesus, in Corinth, before being embodied in a document, will naturally have been modified, supplemented, and sometimes (as above) confused. More especially in certain unimportant and constantly recurring words and phrases we may expect variations. The words "said," "answered," "went," "journeyed," "asked," "questioned," "tempted," "refused," "rebuked," etc., may naturally be expected to differ in the three versions. But greater differences will soon arise. One version will lay greater stress on the details of miracles; another on the relations between Jesus and John the Baptist; another on the law; another on the forgiveness of sins; and this varying emphasis will produce certain modifications of the original traditions. Again, in the early times of the church, the Greek of slaves and freedmen may pass without offense; but in later times an editor of the Gospel, writing for readers of higher rank and better education, will substitute less uncouth words for the original barbarisms. Thus, from varying causes, the

different versions of the tradition will deviate, and when we come to compare three of them together, and to write down the words common to the three, we shall no longer find the original continuous tradition. Gaps in the sense will occur every now and then, owing to the omission of some necessary word. On the other hand, although the literary cement (so to speak) which fills up the interstices between the words and deeds of the Lord may naturally vary, we may expect that the words of the Lord himself will be more carefully preserved, and more identically reported by all three synoptists, so that they will give a more continuous sense, and will enable us to approximate to the original tradition. Let us now take the Gospel of Mark, and set down, from the first two chapters of it, all such words as it contains in common with Matthew and Luke, merely adding in italics such words as may enable the reader to perceive the structure of each sentence; and let us see whether the words thus collected show any traces of a continuous narrative:—

“Esaias | the prophet: || the voice of one crying in the wilderness, Prepare the way of the Lord, make His paths straight. | John | in the wilderness preaching | repent(t). | All | wen(t) forth | to be baptiz(ed) by him. || There cometh one stronger than I | whose shoe-latchet [Mat. shoes] | I am not worthy to loose [Mat. bear]. | I baptiz(e) you with water, He | shall baptize you with the Holy Spirit. || Jesu(s) was baptiz(ed). || The heaven | and the Spirit, as a dove, descend(ing) on Him. And a voice(f) from | heaven | My beloved Son, in Thee [Mat. whom] I am well pleased. | The Spirit drives Him; | in the wildern(ess) forty days tempt(ed) by [Satan; Lu. devil]. || He came into Galilee. || Com-eth) into the house of Simon [Mat. Peter]. | Step-mother sick of a fever. || And the feve(r) left her; | she ministered to the(m). || He heale(d). || He preached(d) in the synagogu(es) of Galil(ee). || There came a leper | saying to Him(m), If Thou wilt, Thou canst make me clean. And stretching forth His hand, He touched him | I will, be thou clean. And immediately there departed from him the leprosy. || And He said to him, Tel(l) no one, but | show thyself to the priest, and offer that which Moses ordained as a testimony to them.” Chap. ii. “|| And they brin(g) Him(m) a paralytic(c). || And seeing their faith, || He said, Thy sins are forgive(n). | The scribes said, This man blasphem-eth). || Jesus said to the(m), | Why reason ye in your hearts? Which is easier, to say | Thy sins are forgive(n), or to say, Rise(e) | and walk? But that ye may know that the Son of Man hath power on earth to forgive sins, He saith to the paralytic(c), | Rise, take thy bed, | go to thy house. And | having taken it up, he went. || And they glorified God. And He saw one sitting at the receipt of custom, and said to him, Follow Me, | and arising he followe(d) Him. | And he feasted Him in his house, and man(y) publican(s) | were feast-ing). || And the Pharisee(s) sai(d) to His disciple(s), Why eat with publicans and sinners? | He | said to them, They that are strong [Lu. healthy] have no need of a physician, but they that are sick. | I came(e) not to call the righteous but sinners. | The disciples of John | say to Him(m): | The disciples of John and of the Phari-see(s) fast(t), but Thine(e) do not. Jesus said to the(m), Can(n) the son(s) of the bride-chamber fast? | the bride-groom is with them. || But the days shall come when the bridegroom shall be taken from them. Then shall they fast. | No one putteth on a | patch upon an old garment(t). No on(e) putteth(h) new wine into old bottles. Else, it will burst(t) the bottle(s) and the wine will peris(h) and the bottles also. But new wine into new bottles. || On the Sabbath they were going through corn-fields; His disciples plucke(d) the wheat-ears. |

The Pharisee(s) said, They are doin(g) on the Sabbath(h) that which is not lawfu(l). He said to the(m), Have ye not read what David did when he was an hungered, and they that were with him? how he went into the house of God, | and ate the shewbread, whic(h) it is not lawfu(l) to eat, save for the priest(s)? || The Son of Man is Lord of the Sabbath.”

Few will have any difficulty in following the above narrative which represents the Triple Tradition of the synoptists. It will be generally admitted that, so far as it extends, it omits little of importance; and its continuity will commend it as likely to be, if not the original tradition, at all events a closer approximation to it than we are likely to find elsewhere. It therefore becomes an important business to consider the scope and variations of the Triple Tradition, — where it is full and ample, where it is meager, where it begins and where it ends.

The commencement of the Triple Tradition has been given in the specimen quoted above. It begins with the proclamation made by John the Baptist, of the advent of the Stronger One. Describing (Mk. iii.) the cure of the withered hand, the choice of the Twelve, the discourse on blasphemy against the Holy Spirit, and the answer to the question, “Who is My mother and My brethren?” it passes (chap. iv.) to the parables of the sower and the mustard seed, which it gives very fully; the rebuking of the wind and the exorcism of the legion (Mk. v.) are given as follows:—

Mk. iv. 35. “Let us go across to the other side. They took Him(m) | in a boat. || They wak(e) Him(m) say- ing), We perish: and He, arising, rebuked the win(d). || And there was a calm. He said to them, | Your faith! || They said, Who is this that even the wind obey(eth) Him?” Mk. v. 1. “And they came across into the land of the [Gadarenes, Gerasenes, or Gergesenes]. There met Him | one [Mat. two] in the || tombs || crying. | What is there between me and Thee, Thou Son of God? || Torment me not. || And he [Mat. they] besought Him . . . into . . . || And He . . . them, | goin(g) forth, they come to (or into) the swine, and the herd rushed down the steep place into the sea [Lu. lake] and [were choked, Mat. perished]. | Those that were feeding them | fled and brought word into the city. || They came || Jesus. || And | they besought Him to depart from | them.”

This is given as a specimen of those passages where the narrative is not so continuous, and where there is some appearance of confusion. The evidence of confusion is confirmed (1) by the fact that a word is used here (*δαίμων*) to denote “spirit” or “demon,” which is not found once elsewhere in the whole of the Gospels, nor, indeed, anywhere in the New Testament (except in the Apocalypse twice), whereas *δαίμονιον* is used forty-five times, and *πνεῦμα* twenty-seven times in the three Gospels alone; (2) by the difference of the names for the locality, Gadara, Gerasa, Gergesa; (3) by the fact that Matthew speaks of two demons instead of one.

The restoring to life of the daughter of a ruler (Mk. and Lu., ruler of a synagogue) is next thus briefly related: “He came into the house. | She is not dead, but sleepeth. And they mocked Him. || Having taken her by the hand | Arise.” Then follow (chap. vi.) the mission of the twelve, Herod’s conjecture about the new prophet, and the feeding of the five thousand.

The walking on the waves is much more briefly recorded (Mk. vi. 46-51). “He went to the mount-ain. | It was late. || They see Him walking on the sea. || It is I; be not afraid.” Then follows a blank, in which Matthew and Mark generally agree, while Luke

is altogether wanting; and, after this, the famous confession of Peter, followed closely by the transfiguration.

From Mark ix. 14 to x. 16 there is a break in the common tradition, which here records little except three or four sayings of the Lord.

In contrast to this discontinuity, Mark x. 17-52 gives a continuous tradition about the rich young man, the promise of reward to the disciples, the predictions of betrayal, and the healing of the blind man near Jericho. The entry into Jerusalem and the purification of the temple (xi. 1-17) are also fairly continuous. The disputes in the temple touching the baptism of John (xi. 27-33), the wicked husbandmen (xii. 1-12), and the tribute money (xii. 13-17) are very continuous. A brief denunciation of the Pharisees, who love the first seats in synagogues and at feasts, is found in Mark xii. 38-40. The Triple Tradition then touches on the second coming of Christ. Luke has here omitted many important passages which are recorded by Matthew and Mark alone.

In Matthew and Mark there follows the avowal that "of that day or hour none knoweth, not even the angels in heaven, nor even the Son, but only the Father." But Luke omits this. The Triple Tradition passes to the betrayal of Jesus. The traitor's compact (Mk. xiv. 10, 11) and the visit to the city to eat the Passover are briefly narrated. From this point the Triple Tradition becomes more and more scanty, till it leaves us at last little more than a few disconnected sayings of Jesus.

To sum up the contents of the common tradition, it omits the genealogies, miraculous incarnation, and the picturesque details of the infancy; it lays emphasis on the relations between John the Baptist and Jesus; it contains none of the parables except the sower, the mustard seed and the wicked husbandmen, and few of the long discourses of Jesus, except an abridged prediction of the second coming. The disputes between Jesus and the Pharisees about the Sabbath, about fasting, about exorcism, about the baptism of John, and the tribute, and Christ the Son of David, and the dialogue with the Sadducees about the resurrection, are very fully given; and so also is the dialogue with the rich young man. Indeed, it is a collection of dialogues and anecdotes rather than a set treatise of doctrine or biography. The sayings of Jesus recorded in it are short, pithy and abrupt, and many of them are polemical. Only now and then do we find a sentence which goes down deep below all polemics, and reveals a deep-laid spiritual plan. But, putting such sentences together, we perceive that the Triple Tradition describes a prophet wholly different from any that had before appeared in Israel; a prophet who not only (like Isaiah) protested against sabbaths and purifications as ends in themselves, but who also preached the Fatherhood of God in a manner entirely peculiar to Himself, and who set aside the Mosaic law of divorce. He also instructed his disciples to enter into the kingdom as little children (x. 15), and seemed to have attached a certain symbolic mystery to childhood as representing Himself. He taught His disciples further to devote their lives to Him, and to ignore all life apart from Him ("to confess Christ, to deny themselves"). From the first He claims the power of forgiving sins, and, as soon as one of His disciples confessed Him to be the Messiah, He prepared for death, predicting that He should die, but rise again. Then, after prophesying the fall of the temple, and great distress in all nations, He predicted a final triumph for his disciples, and, after bequeathing Himself, His body and His blood, as at a funeral feast, as His final legacy to His disciples, He was arrested and put to death.

Several miracles of healing are recorded, and, in addition to these, the exorcism of the Gadarene (in which, however, great confusion is apparent), the stilling of the

storm, the feeding of the five thousand, and the transfiguration. From the beginning of the discourse on the second coming, Luke diverges more and more from Matthew and Mark. After the death of Jesus, Matthew and Mark continue to agree in words and phrases, but a little confusion is apparent; and the tradition suddenly terminates without any record of the appearance of Jesus to His disciples. However we may regret this, it is perhaps what may be naturally expected on the hypothesis that we have before us an early tradition originated at a time when the numerous manifestations of Jesus after his death were still attested by living witnesses; when as yet it had been found impossible to reduce the experiences and impressions of those who had seen Him—impressions necessarily variable and transient, blended with fear and with an excitement bordering on ecstasy—to a consistent and historical shape; and when it had not yet been found necessary to define and harden the narrative so as to adapt it for the purpose of meeting doubts and objections.

The Additions Common to Matthew and Mark.—The additions to the Triple Tradition which are found in Matthew and Mark, but not in Luke, are the following:

(1) The description of John the Baptist (Mat. iii. 4; Mk. i. 6); (2) the ministering of the angels (Mat. iv. 11; Mk. i. 13); (3) the calling of the fishermen (Mat. iv. 18-22; Mk. i. 14-20); (4) the murmuring of His friends at Nazareth (Mat. xiii. 53-57; Mk. vi. 1-4); (5) the influence of Herodias in procuring John's execution (Mat. xiv. 8-13; Mk. vi. 25-29); (6) the walking on the water (Mat. xiv. 22-28; Mk. vi. 45-51); (7) the disputes with the scribes from Jerusalem (Mat. xv. 1-20; Mk. vii. 1-23); (8) the story of the Syro-Phœnician woman, which is narrated by Matthew and Mark in widely divergent language, but with an almost identical conclusion (Mat. xv. 21-28; Mk. vii. 24-30); (9) the feeding of the four thousand (Mat. xv. 32-38; Mk. viii. 1-9), and the comparison between this miracle and that of the five thousand (Mat. xvi. 5-12; Mk. viii. 14-21); (10) the saying of Jesus that Elias had already come (Mat. xvii. 12; Mk. ix. 13); (11) the discussion of the enactments of Moses concerning divorce (Mat. xix. 4-8; Mk. x. 2-9); (12) the saying (but Luke inserts it elsewhere) that "many that are first shall be last" (Mat. xix. 30; Mk. x. 31); (13) the petition of the sons of Zebedee for the chief places (Mat. xx. 20-28; Mk. x. 35-45); (14) the withering of the fig-tree (Mat. xxi. 18-22; Mk. xi. 13, 14, 20); (15) the introductory question of the lawyer, "Which is the great commandment" (Mat. xxii. 36; Mk. xii. 28); (16) in the discourse on the last day, Luke omits reference to the "consummation," *δυνελευσις* (Mat.), *δυνελευσθαι* (Mk.); "these things are the beginning of troubles;" "the abomination of desolation," etc.; "he that readeth let him understand;" "pray that your flight may not be in winter;" "(tribulation) such as was not from the beginning till now, nor ever shall be," the expression about the "shortening" of the days "for the elects' sake;" "He shall send His angels, and gather together the elects;" "of this hour the Son knoweth not;" (17) later on, Luke omits the anointing of Jesus "for His burial" (Mat. xxvi. 6-13; Mk. xiv. 3-9); (18) "I will smite the Shepherd," etc., and "I will go before you into Galilee" (Mat. xxvi. 31, 32; Mk. xiv. 27, 28); (19) the compact of Judas with the priests that a kiss should be the signal (Mat. xxvi. 48; Mk. xiv. 44); (20) the false witness about "destroying the temple in three days" (Mat. xxvi. 59, 62; Mk. xiv. 55-60); (21) the taunt "Thou that destroyest the temple" (Mat. xxvii. 40; Mk. xv. 29); (22) the utterance of Jesus, "My God, My God, why hast Thou forsaken Me?" with the consequent misunderstanding of the by-standers (Mat. xxvii. 46-49; Mk. xv. 34-36); (23) the utterance of the angel (or an-

gels) at the tomb, "He goeth before you into Galilee; there shall ye see Him" (Mat. xxviii. 7; Mk. xvi. 7).

In considering these passages it is natural to ask whether any reason (besides ignorance of them) can be alleged why Luke should have omitted them. It is scarcely possible to fail to see designs in some of these omissions—for example, in those which relate to John the Baptist and Elias (1), (5), and (10). The author of the Acts of the Apostles is by general consent admitted to be identical with the author of the Third Gospel. Now remembering that Luke in the Acts informs us that, many years after the death of Jesus, there were in Ephesus several disciples who were baptized with the baptism of John, and knew nothing of the Holy Spirit, we may well understand that the author of the Acts finds it necessary, when writing a gospel, to put in as clear a light as possible the subordination of John to Jesus. Accordingly, in place of the graphic description of the austere food and garb of the prophet, he gives a description of his teaching, as containing the elements of a simple and almost commonplace morality, intended merely to prepare the way for a higher teaching, and he adds an express negative from the prophet in answer to those who doubted whether John were the Messiah. Repeatedly does Luke deviate from the common tradition of Matthew and Mark on the subject of Elias; and in each case the object is apparent. Only a close inspection of a harmony of the Gospels will make this clear; but three or four passages may be mentioned which point in this direction. Luke has already (i. 17) declared that John will go before Jesus "in the spirit and power" of Elias, but he cautiously avoids committing himself to the tradition (Mk. ix. 13; Mat. xvii. 13) that John was Elias. The belief in an actual transmigration of souls he will allow the multitude to entertain (ix. 8, 19), but not Herod; for whereas in Mark (vi. 16) Herod says, "Whom I beheaded, viz., John, this man (*oûros*, corr. text), is risen from the dead," Luke, by a slight transposition of the traditional words, converts the proposition into a question: "John I beheaded; but who is this man?" And, further, in order to prepare the way for the interview between Herod and the Lord—which he purposes to describe at the end of his Gospel (xxiii. 8, 9), and to refer to in his continuation of the Gospel (Acts iv. 27)—he adds the words, "And he (Herod) was desirous to see Him." Again Mark (ix. 6) tells us that Peter "not knowing *what to answer*," proposed to build three tabernacles for Jesus, Moses, and Elias; but Luke reads (ix. 33), "not knowing *what he said*," as if to caution the reader against supposing that Elias or Moses could be seriously placed on the same level as Jesus. For the same reason he omits the irrelevant misunderstanding of the bystander who supposed that Jesus in his last moments called for Elias, and even the utterance itself (Mat. xxvii. 49; Mk. xv. 36).

With reference to many of the other omissions it will be noticed that Luke seems to have before him somewhat different versions of the narratives, which different versions he inserts elsewhere. For example, he gives a version of the calling of the apostle-fishermen, which adds a miraculous draught of fishes, thereby approximating to the narrative in the Fourth Gospel (xxi. 6-11). Again Luke places the murmuring of the Nazarenes much earlier, in the fore-front of the ministry of Jesus, as was very natural, and gives an entirely different version of it. The ministry of the angels after the temptation he omits; but he alone records the ministry of the angel (xxii. 43) when Jesus was tempted in Gethsemane, for which temptation he carefully prepares the way by saying (iv. 13) that the devil departed from Jesus only "for a season." As regards the anointing "for the burial," it is probable we have a different version of it in his

story of the woman that was "a sinner" (vii. 37). The reasons for the omission of the feeding of the four thousand and the withering of the fig-tree are not so obvious. The omission could hardly have been dictated by any desire to minimize the supernatural (seeing that Luke contains many miracles peculiar to himself, and that he does not shrink from giving in full detail the exorcism of the Gadarene). It is possible that he omitted the former as being too similar to the feeding of the five thousand and to require to be repeated; and if he regarded it (as the author of the Fourth Gospel does) as having a sacramental meaning, one story of the kind may have seemed sufficient. If the story of the withered fig-tree was regarded by him in the same way (rather as emblematic than as historical), then it may have been replaced in his narrative by the story of the barren fig-tree (peculiar to Luke), to which the master came seeking fruit and finding none. It is also noticeable that the moral (on the power of faith) deduced from the withering of the fig-tree in Matthew and Mark is contained in Luke, but in a different form. In Matthew and Mark it runs: "If ye say to this *mountain*, Be raised up and cast into the sea;" whereas in Luke (xvii. 6) it is, "Ye might have said to this *sycamore tree*, Be rooted up and planted in the sea." This perhaps slightly confirms the supposition that Luke regarded the narrative of the fig-tree rather as a parable than as a fact. But it is important to bear in mind that we have little more than the evidence of conjecture to explain some of Luke's omissions. For example, the story of the walking on the waves, as told by Matthew and Mark, represents the disciples as being alarmed by the thought that the apparition of the Lord was only a spirit (*πάραιστος*); unless Luke considered that the ground of this narrative was occupied by his account of a similar fear when the disciples beheld the Lord after the resurrection, it is hard to suggest any reason for its omission. This class of omissions may be terminated with that numbered above—the compact of Judas concerning the signal. It is obvious here that Luke has another version of the tradition in his mind. He alone of the three records the words of Jesus, "Betrayest thou the Son of Man with a kiss?" thereby making it unnecessary to explain (with Matthew and Mark) that the kiss was a signal fixed by the traitor.

Another class of passages may possibly have been omitted as being not of interest to the Gentile world, or as being liable to misunderstanding or perversion.

The above explanation of Luke's omissions may only partially commend itself to the reader; but few will fail to see that there is at least some method and motive in most of them. It is a matter of certainty that in the Triple Tradition many of Luke's omissions and modifications of phrases and words are not accidental but editorial: it is but natural therefore to suppose (especially when reasons can easily be assigned) that editorial reasons may also explain omissions and modifications of narratives and discourses. Of course it is not maintained that Luke, or any individual editor, made these changes on his own responsibility. Many of them are probably the result of a "Gentile use" which had gradually sprung up in certain churches, and which was not created but adopted and expressed by the author of the Third Gospel. Consequently we are not obliged to suppose that the omission resulted from ignorance. The very fact that it is easy to supply motives and reasons for the omission of these narratives increases their credibility, by diminishing the probability that they were late traditions unknown to the author of the Third Gospel. The passages omitted are generally in the style of the common tradition, and they contain

incidents of a similar kind to the incidents of the common tradition. It only remains to add that (except in the story of the Syro-Phœnician woman, and, in a lesser degree, in the question of the lawyer about the great commandment) Matthew and Mark closely agree whenever Luke separates himself from them. This is also found frequently to be the case in the Triple Tradition. In the midst of very similar context, if Mark is identical, or nearly so, with Matthew, in the expression of some action, it will be found that Luke often suddenly diverges, or makes some omission.

The Additions of Mark and Luke.—Additions of any length are very few:

(1) An exorcism of an unclean spirit (Mk. i. 21-25; Lu. iv. 31-35); (2) the account of Jesus retiring to a solitary place, when He declares that He must carry the gospel elsewhere (Mk. i. 35-39; Lu. iv. 42-44); (3) the saying of John the son of Zebedee, "Master, we saw one casting out devils in Thy name, and we forbade him," and the reply of Jesus (Mk. ix. 38-40; Lu. ix. 49, 50); (4) the short denunciation of the Pharisees that devour widows' houses (Mk. xii. 38-40; Lu. xx. 46, 47); (5) the story of the widows' mite (Mk. xii. 41-44; Lu. xxi. 1-4). Shorter similarities are—(6) a mention of Jesus as being in retirement (Mk. i. 45; Lu. v. 16); and (7) a mention of "Tyre and Sidon" as places to which the fame of Jesus had spread (Mk. iii. 8; Lu. vi. 17). There is a close verbal agreement between Mark and Luke in the exorcism of the "legion" (a name that does not occur in Mark); in the raising of the daughter of Jairus; and in the stilling of the storm. But gradually as Matthew approximates to Mark, Luke deviates from Mark. There is a return to similarity in the preparation for the Passover (Mk. xiv. 12-16; Lu. xxii. 7-13); but from this point Luke deviates more and more, and, with the exception of two words (*στράως* and *φόνος*) in the incident of Barabbas, and of a somewhat closer approximation in the incident of Joseph of Arimathea, it may be almost said that Luke has henceforth nothing in common with Mark, except what is found in the Triple Tradition.

Most of the incidents common to Mark and Luke are so few and so simple that their omission by Matthew requires no explanation. It is possible that the names Jairus and Legion did not exist in the earliest tradition, as it presented itself to Matthew; the "authority" which Mark illustrates (compare i. 22 with i. 27) by exorcism, Matthew applies (and perhaps justly) rather to our Lord's method of teaching (vii. 28, 29); but it is difficult to suppose that any other cause than ignorance could have caused the omission of the saying of Jesus concerning the widow's mite. It is certain that, in some at least of these passages, Mark represents the earlier, and Luke a modified tradition. Luke, writing with a literary purpose, has softened many early irregularities, which in Mark retain their original harshness. It is probable that in all passages common to Mark and Luke alone, wherever Mark and Luke differ, Mark represents an earlier, and Luke a later version of the original. And generally it may be said that Luke follows the tradition of Mark most faithfully when it deals with Galilee, and least when it deals with Jerusalem.

Additions common to Matthew and Luke.—These introduce an altogether new element into the tradition. Hitherto the triple tradition of Matthew, Mark and Luke (as well as the double tradition of Matthew and Mark, and of Luke and Mark) has consisted mostly of short "words of the Lord," set in a framework of short narratives, and very seldom agreeing exactly for more than seven or eight consecutive words. But we now come upon "words of the Lord" in Matthew and Luke, some of which agree exactly for several sentences.

What was the origin of this close agreement? In order to gain some view of the data for solving this problem, we must briefly consider the principal passages common to Matthew and Luke alone.

In the consideration of the passages in which Christ's words as spoken by him are quoted, one fact strikes us at once, that the Lord's prayer is not *verbatim* the same in Matthew and Luke. If *this* is not identical, it might be thought that we cannot expect any words of the Lord to be identical. And indeed, as a matter not of hypothesis but of fact, those words which have most strongly appealed to men's hearts, and have been most frequently on their lips, from the earliest times of the church; those sayings which have given the tone to Christian life, which have encouraged martyrs, and stimulated waverers, such as "Fear not them which kill the body," "Who-soever shall confess," etc.; "He that loveth father or mother more than Me," etc.—all these, though identical as regards thought, and similar as regards words, are nevertheless not exactly similar in Matthew and Luke. The exactly similar passages are of a very different nature: they are for the most part passages of a prophetic or historical rather than a doctrinal character with application to individuals. All these passages, dealing as it were on a large scale with the will of God, as it affects religions and nations rather than as it affects individuals, are better fitted for reading in the services of the church than for being transmitted from mouth to mouth in the family from father to son, or from catechist to catechumen, for personal and individual guidance; and consequently they seem more likely to have been handed down in a book than by means of oral tradition. In proportion as a rhetorical passage limits itself to individual application, it seems to have been modified by oral tradition so as to deviate from exact agreement. The only exception perhaps to this rule is in the denunciation of the Pharisees (16). This passage, being of the historical type, ought (according to our rule) to be identical; but Luke differs from Matthew considerably. Possibly in the earliest days of the church, and especially in the synagogues of Palestine a few years after the death of Christ, the angry conflicts between the disciples of the Lord and the Pharisees may have frequently reproduced and modified by traditional influences the original form of our Lord's denunciation; so that perhaps this subject comes naturally under the head of traditional doctrine. It must also be remembered that, as Luke approaches the later period of the work of Christ in Judæa, he deviates more and more both from Matthew and from Mark; perhaps because there was a Judæan as well as a Galilean tradition of the life of Jesus, and Luke, in the latter part of his history, depended mainly on the former. These two considerations may explain the deviation of Luke from Matthew in the denunciation of the Pharisees.

That the parables should diverge is natural. Their length and number would prevent them from being remembered, or passed from mouth to mouth, with the same fidelity with which the shorter words of the Lord would be preserved; and as they were probably often repeated by Jesus in varied shapes, no one particular shape of any parable would seem to claim a place in the written document of the words of the Lord; as being of the same importance as the "Woe to Jerusalem," or the other strains of poetic prophecy. The parable of the sower, coming first in order, and being typical of the rest of the parables, and having appended to it an explanation of the motive of the parabolic teaching, would naturally attract attention from the earliest times, and consequently it found a place in the Triple Tradition; but this privilege was accorded to no

other parable. There is therefore no ground whatever for inferring from the discrepancy of the language of a parable in Matthew and Luke (e.g., the parable of the lost sheep) that it was not actually uttered by Jesus. The exact similitude of thought and sequence of incident in that parable, as recorded by Matthew and Luke, proves to demonstration that the two records are derived from one source.

The following are our conclusions therefore about the additions to the Triple Tradition made jointly by Matthew and Luke. (1) Their omission by Mark furnishes no argument for their rejection, inasmuch as Mark also omits the Lord's Prayer, and obviously aims at narrating the acts rather than the sayings of the Lord. (2) Of the additions, some appear to be based upon common tradition, or on documents modified by tradition—principally those short trenchant sayings (including the Lord's Prayer) which are of a universal and private application. (3) Others appear to be based upon a common document; and in these documentary additions (as perhaps to some extent in the rest) Luke seems to have modified the original tradition, in words and phrases, with a view to purity of style and intelligibility, or to remove difficulties. (4) In chronological order and arrangement Matthew and Luke pursue divergent paths; Matthew's object being to group and mass the teaching of the Lord, while Luke aims at supplying motive, occasion, place, and time for each utterance. (5) It is scarcely possible to doubt that the arrangement of neither is to be implicitly adopted. There is much reason to doubt whether what is called the Sermon on the Mount was actually delivered at one time in the shape in which Matthew presents it; and it is equally questionable whether the lamentation over Jerusalem was delivered in a village of Galilee, and whether the denunciation of the Scribes and Pharisees (as murderers, on whom should be avenged all the innocent blood shed from the beginning of the world) was uttered at the table of a Pharisee. (6) As regards the parables, we have to depend—in our conjecture as to the degree to which the thoughts of Jesus have been preserved—mainly upon the presence in them of the same spiritual power and insight which are perceptible in His other recognized genuine sayings. But the dissimilarity of the language of the parables in Matthew and Luke (where the thought is the same) gives no ground for denying that parables on the same subjects, and to the same effect, were actually delivered by Him. (7) Since the hypothesis that Luke borrowed from Matthew is untenable, and since therefore we must suppose that Matthew and Luke borrowed these additions independently from some early document, we may infer that, before the times of Matthew and Luke, a document containing words of the Lord had existed long enough, and had acquired authority enough, to induce two editors or writers of Gospels, apparently representing different schools of thought and writing for different churches, to borrow from it independently.

This last conclusion is of the greatest importance; for though the document may be, and almost certainly was, later than the Triple Tradition, yet it would have the advantage of preserving the original utterances of the Lord comparatively unimpaired by traditional transmutations. When to this consideration is added the authoritative nature of the words of the Lord in this document, their direct reference to events, and the extreme improbability that any disciple would have, or could have, invented them,—for which of the apostles or subordinate disciples could have invented the discourse on "the lilies of the field," or the lamentation over Jerusalem, or the speech which likens John to "a reed shaken by the wind," and pronounces him the greatest of the prophets, yet less

than the least in the kingdom of God?—we are led to infer that in all probability we have in these additions of Matthew and Luke a very close approximation to some of the noblest and most impressive utterances of Jesus Himself. With the exception of the healing of the son of the centurion, and the narrative of the temptation, the additions common to Matthew and Luke introduce no new supernatural element.

The Additions and Peculiarities of Mark.—It might be expected that when we come to the additions peculiar to each of the three synoptists we should find some increase to the accounts of supernatural events. Now it seems to be a striking proof of the antiquity of the Second Gospel that we find in it no additions of this kind. Not that Mark does not lay stress on what appears to be supernatural; on the contrary, he records acts of instantaneous healing with greater minuteness of detail than any other evangelist; but we find in Mark no mention of our Lord's birth or childhood, and only the barest prediction of His resurrection. As an explanation of the deficiency of information on the resurrection, it has been frequently suggested that the latter part of the Gospel may have been lost; and, less frequently, that the Gospel was deliberately closed with the prediction of the resurrection by the mouth of an angel, because "the manifestations of the risen Saviour belong (according to the earliest notions) no longer to the earthly sphere of the action of Jesus, and therefore do not fall within the province of the Gospel." Few Greek scholars, however, will be induced to believe that the author of the Second Gospel deliberately chose to end a book on the good news of Christ with the words *ἐφοβούντο γὰρ* (ephoboynto gar), for they were afraid. Others have suggested that the last page of the MS. may have been accidentally destroyed. But this suggestion seems to overlook the consideration that the MS. was in all probability written not for a private library but for use in the church, and that it would immediately be multiplied by copies. Again, we know, from reference to Mat. xxviii. 8 and Lu. xxiv. 9, that the common tradition ceases with the return of the women from the Lord's tomb. But it is precisely at this point that the genuine Mark (xvi. 8) also terminates. Now, that a page should have been torn out containing just that part of Mark which followed after the close of the common tradition would be a most remarkable and unlikely coincidence. It seems far more probable that Mark ends his Gospel here because the common tradition ended here, and because he scrupled to add anything to the notes and traditions which he knew to rest upon a higher authority than his own. If this be the true explanation, it stamps with the seal of a higher authority such traditions as have been preserved to us by so scrupulous an author. We proceed therefore to an investigation of the peculiarities of Mark, with the confidence in him increased rather than diminished by the fact that he has neither the introductions nor the appendices which are found in the rest of the Gospel.

The first thing that strikes us in Mark is his duality. Verbosity we might be tempted to call it at the first sight; but, though there is a certain disproportion in the space assigned to detail, quality, and not verbosity, is the better word. It is this duality which gave rise to the erroneous supposition that Mark had borrowed from Matthew and Luke. But it may be shown, by reference to passages where there can be no possibility that Mark borrowed from Matthew and Luke (Mark ii. 19; iii. 5; iii. 27; iii. 22, 30; v. 3, 5; xii. 44), that this duality is a part of Mark's style. But, so far, we merely note that some of Mark's dualities of expression might be explained as double renderings of the same original. Only one parable is peculiar to Mark; it is one that illustrates

(iv. 26-29) the spread of the kingdom of God by the quiet, unperceived and gradual growth of corn. The subdued tone of this (one of the most interesting of all the parables) was perhaps the reason why it was not at first widely known, as it undoubtedly is the reason why modern readers pay it too little attention. Mark also amplifies the story of the Baptist's execution (v. 20-28), and the graphic story of the exorcism of the "legion." For the rest, the other additions peculiar to Mark consist of either dual expressions and amplifications of detail, or of realistic details which would naturally be subordinated, in later times, as likely to be stumbling-blocks.

One proof of the early composition of Mark is the rudeness and even vulgarity of his Greek. He uses a great number of words which are expressly forbidden by the grammarians. Such words as these might naturally find their place in the mongrel Greek of the slaves and freedmen who formed the first congregations of the church in Rome; and they are therefore tokens of a date of composition earlier than that of Matthew and Luke. For it is not conceivable that such terms (some of which would so have jarred upon the ear of an educated Greek as almost to correspond to our "slang") should be substituted in later times for a more tasteful vocabulary; whereas it is easily conceivable, and *a priori* probable, that better Greek should, in the prosperous days of the church, be substituted for worse.

It is a natural characteristic of an unpracticed reporter that he lays undue stress on a few vivid expressions and striking words, and that he reproduces or exaggerates anacolutha which, though not objectionable in a speech, are inconvenient in a book, because they tend to obscure or subordinate the subject matter.

A still more cogent proof of the early date of Mark is that this Gospel contains many expressions which would be likely to be stumbling-blocks in the way of weak believers, so that they are omitted in the later Gospels, and would not have been tolerated except in a Gospel of extreme antiquity.

Mark neither masses similar sayings or deeds, as Matthew does, nor supplies motives and occasions, as Luke does. It is most interesting to note that the words "law," "lawyer," which played so prominent a part in Matthew and Luke, are not to be found at all in Mark's narrative. His business is simply with the life of Christ. Again, whereas Matthew and (in a less degree) Luke are careful to point out that Jesus fulfilled the sayings of the prophets, Mark, on the other hand, though he recognizes in John the Baptist (i. 2) the messenger predicted by the prophets, sees in Jesus a Being too absorbing and interesting as a man to find much time for contemplation of Him as the mere fulfiller of prophecy. In a word, Mark writes of Jesus, not as the destroyer or fulfiller of the law, not as the Messiah predicted by the prophets, not as the refuge of the Gentiles, but rather as a man; subject to anger, and disappointment, and weariness; not knowing all things; not able to do all things; but endowed with strange powers of healing the souls and bodies of men; and carrying out a mysterious plan for the regeneration of the world, through a spirit of childlike obedience to God and brotherly love toward men; lastly, a man who assumed for Himself and for His disciples a power of forgiving sins, and who based all the success of His plans upon His predicted death and resurrection, to be followed by a second coming.

True, Mark's Gospel is disproportioned, inartistic, and uncouth — scarcely, indeed, to be called a book, but rather a collection of graphic anecdotes. Yet it has a unity derived from its naive simplicity and single-mindedness, in recording whatever it records as it was de-

livered from the earliest sources in its entirety; and possibly in that string of anecdotes the development of Christ's life and work may be traced with not less clearness than in the ampler and more artistic production of Luke.

Additions and Peculiarities of Matthew.—The preface of the Gospel of Matthew reveals a part of the purpose of the whole Gospel, in tracing the genealogy of Jesus, not from David merely, who was under the law, but from Abraham, who was the receiver of the promise and the father of the faithful. Such a genealogy is the fitting preface of a book which aims at exhibiting the law, not as trampled upon, but as fulfilled and developed into a higher law of promise, in which all the families of the world were to be blessed. But by this time also the church required some distinct affirmation concerning the divine origin of Jesus. The gap left in the opening of Mark's Gospel needed to be filled up. The mere earthly pedigree from Abraham was insufficient; nor did it suffice that Jesus should be declared to be spiritually the Son of God. It was necessary that the verity of the spiritual birth of Jesus from the Father should be embodied in a narrative so expressed as to be intelligible to all.

The differences between the prefaces of Matthew and Luke are obvious, and need no stress laid on them, except as illustrations of the freedom which, at this period, was allowed in the handling of the various introductions to the Gospel tradition. It is obvious, for example, that Luke regards Nazareth as the residence of Joseph and Mary from the first (i. 26; ii. 4), whereas Matthew seems to represent them as selecting Nazareth for their new home after the birth of Jesus and the return from Egypt, only because they were afraid to return to their old home in Judea, thereby fulfilling an ancient prophecy (ii. 23). Throughout his preface, as throughout his version of the Triple Tradition, Matthew always bears in mind that Jesus came to fulfill the prophets as well as the law. The birth from a virgin (i. 25), the birth in Bethlehem (ii. 6), the return from Egypt (ii. 15), the massacre of the children in Bethlehem (ii. 18), and the residence in Nazareth (ii. 23) are all spoken of as the consequences of prophecies. It is scarcely fanciful, also, to see some reference to the infancy of Moses, and the slaughter of the Israelitish children by Pharaoh in the massacre of the children of Bethlehem by Herod.

Passing next to Matthew's version of the Triple Tradition, we note first the prominence given to the law. Instead of giving a chronological account of our Lord's acts and sayings, Matthew prefers to collect a mass of doctrine into one continuous discourse, known from early times as the Sermon on the Mount. This discourse follows almost immediately on the commencement of His public life; and it contains the new law of the new kingdom. The Sermon on the Mount corresponds to the law given on Mount Sinai, and a thread of contrast runs through the former, comparing in each case that which has been said "of old time" with that which the New Lawgiver prescribed, and showing that in each case the new law, though more gentle, was also more stringent and more exacting than the old. Luke recognizes that no jot or tittle is to pass from the law till all be fulfilled; but nowhere in Luke shall we find the strong language which declares (Mat. v. 19) that he who breaks, or teaches others to break, one of the least of the commandments of the law, shall be called least in the kingdom of God.

The genealogy traced from Abraham, and the stress laid on prophecy, as well as the prominence thus given to the law, all suggest that this book was primarily intended for Jewish readers; and this supposition is con-

firmed by the whole tenor of the Gospel. Matthew finds less space than Luke for the parables which point to the inclusion of the Gentiles, and more for those which point to the exclusion of the workers of lawlessness and of the unworthy Jews. He alone among the evangelists has the saying, "Many are called, but few chosen." But Matthew, more than the rest of the evangelists, seems to move in evil days. Where Luke speaks exultantly of "joy in heaven" over one repentant sinner, Matthew, in more negative and sober phrases, declares that it is not the will of the Father that one of the little ones should perish.

Besides the fulfillment of prophecy mentioned in the preface, Matthew sees several others, (6), (25), (43), (44), (54), which are not mentioned in the Triple Tradition, and these applications of prophecy sometimes contain obvious confusions.

Few new miracles are introduced by Matthew into the body of his work. Two of these consist of acts of healing, and two are connected with Peter, viz., Peter's partial success in walking upon the waves, and his (supposed) extraction of a stater from the mouth of a fish. But the words implying the latter miracle have possibly arisen from a misunderstanding; at all events they leave in the mind "a doubt whether, in this instance, some essential particular may not have been either omitted or left unexplained."

In its moral teaching this Gospel lays special stress upon the sin of religious ostentation and hypocrisy. In a strong passage consistent undissembling wickedness is preferred to dissembling wickedness, and the Pharisees are described at greater length than in any of the other Gospels. Yet this Gospel does not always dwell upon the dark side of Christ's doctrine. It preserves also some of the Lord's most "comfortable" sayings: the blessings upon the meek and merciful; the saying that the angels of the little ones always behold the face of the Father; and, above all, that saying which is a gospel in itself, "Come unto Me, all ye that labor, and are heavy laden," etc.

In speaking of the date of Matthew's Gospel, so far as it can be determined from internal evidence, we must remember that, if the work be composite, the fact that some of Matthew's additions are clearly late will not show that others may not be early.

The uncertainty in which Mark left the resurrection of Jesus would naturally seem to later writers to require to be removed; and accordingly we find that Matthew adds to the vision of angels (two instead of one) a manifestation of Jesus Himself. But the whole of this narrative, though apparently in Matthew's style, and though containing internal evidence of being composed long after the events narrated, is nevertheless strangely disjointed. Yet, its very defects, its disconnectedness, incompleteness and abruptness, indicate a date earlier than that of the more connected and complete narratives of the Third and Fourth Gospels. Matthew separates from Mark's narrative at the departure of the women from the tomb, having previously given an account (repeated by no other evangelist) of the resurrection from the dead of a great number of "saints," who "went into the holy city and appeared unto many." Without any further mention of the place of meeting, the disciples are said to have gone to "the mountain, where Jesus made agreement (*ἐράξατο*) with them (to meet them)." To avoid this dislocation, there has been suggested the desperate remedy (Weiss, *Matthäusevangelium*, page 582) of rendering *ἐράξατο*, "laid down the law," with reference to the Sermon on the Mount; but the probable solution is that Matthew here extracts and separates from its context some ancient tradition which is obscured through want of its framework. Again Matthew tells

us that, upon this mountain, only the eleven were present, and that while some of them worshiped, others "doubted." This statement is of no value as evidence that it was acknowledged, even so late as the compilation of Matthew's Gospel, that some at least of the manifestations of Jesus were of such a nature that, while they brought immediate conviction to some beholders, they did not at once convince others, even of His nearest disciples.

It is noteworthy that Matthew makes no express mention of the ascension of Jesus. But it is possible that he considers this final manifestation on the mountain top to have terminated with the ascension; for Matthew, describing the farewell of Jesus, appears to have in his mind the picture, contemplated also by Daniel, of the Son of Man endowed with all power and seated on the clouds of heaven.

Additions and Peculiarities of Luke.—Before speaking of the passages peculiar to Luke, it will be convenient to consider his avowed purpose in writing, and some peculiarities of his style. The dedication to Theophilus, a name which is now believed by many to be merely typical of every reader who is so far "loved of God" as to be admitted into the church of Christ, states that the author purposes to write an account "in order," and implies that many previous "attempts" (*ἐπεχείρησαν*, a word implying impotence; cf. Acts ix. 2, 9; xix. 13) at similar compilations had not been "in order;" further, it informs us that the object of the treatise was not to tell the reader anything that was new, but rather to give him an ampler knowledge of the certainty of those things which were then and always had been fully believed in the church, even as they had been handed down by those who had been from the beginning eye-witnesses and ministers of the word. Without going so far as to affirm that the word handed down (*παρέδοσαν*) excludes written tradition (Westcott's *Introduction*, 186, 203), is at least remarkable that Luke distinguishes between the "eye-witnesses" and those whose attempts he disapproved—saying that the latter attempted to draw up a "connected narrative," whereas the former merely "handed down" the facts. This amounts almost to a denial on the part of Luke that any "eye-witness" (that is to say, apostle) had up to that time written any narrative (so far as Luke knew) of the life of Christ. It implies also that the words and deeds of the Lord had been recorded by many without arrangement, and that the author purposed to arrange them. The literary and artistic purpose of the author appears in words and phrases, as well as in the conceptions. Writing perhaps principally for readers to whom the Greek of the original tradition would be in many respects distasteful, he substitutes more classical words for many that are used by Matthew and Mark in the Triple Tradition.

The question of Luke's style is specially important because the striking differences between certain portions of his Gospel which are all, though in very different styles, found in his Gospel alone (occurring neither in the Triple Tradition, nor in the parts which Luke has in common with Matthew or in common with Mark), might naturally induce even a careful student to believe that they are composed by different authors.

Considering the additions peculiar to Luke our conclusion must be (1) that as Luke has modified the Triple Tradition, and the words of the Lord common to himself and Matthew, by alterations of words and phrases, so and much more has he modified other traditions or documents which he has introduced into his work; and (2) that those portions of the part of the Gospel peculiar to himself which have a more archaic and Judaic rhythm and vocabulary than the rest may be either

translations from Aramaic documents, or imitations, conscious or unconscious, of the books of the LXX.,—natural adaptations of the style to the subject, like the language of Shakespeare's *Julius Caesar* as compared with the less simple and dignified language in his English plays of the same date. It is probable, however, that when the evidence is more thoroughly classified than it has hitherto been, it may at least demonstrate the existence of different documents in Luke, whether translations or not.

Passing now to the consideration of Luke's additional subject matter, and reserving the supernatural element to the last, we will speak first of the doctrine. The keynote is struck in the song of Zacharias, and repeated in the first sermon of Jesus in Nazareth. The object of the messenger of Jesus is "to give us knowledge of salvation" by the "remission of sins," by reason of "the tender mercy of our God, whereby the dayspring from on high hath visited us to give light to them that sit in darkness;" and the object of Jesus Himself is "to preach the gospel to the poor," to "heal the broken-hearted, to preach deliverance to the captives, and recovering of sight to the blind." All through the Gospel (or at least the parts peculiar to Luke) there appears to a greater degree than in the First or Second Gospel the contrast between light and darkness, God and Satan, sin and remission of sins, culminating in the triumph of forgiveness and mercy; so that in the very last words of Jesus to His disciples the proclamation of "repentance and remission of sins" is made the prospect of the future gospel to all nations.

The universality of the Gospel is more marked in Luke than in Matthew or Mark. The seventy missionaries appear to be emblematic of the preaching of the gospel to the seventy nations of the earth. The preference of the Gentiles to the Jews would seem to be indicated at the very outset of the public life of Jesus in the sermon at Nazareth, if we could accept this as chronologically and historically accurate.

In connection with the gentler and more inclusive side of the gospel teaching, it may be mentioned that Luke lays especial stress on the part played by women alike in discerning the providence of God, in ministering to Jesus, and in eliciting some of His most helpful utterances.

Probably the most perplexing part of Luke's doctrine is found in the parables of the unjust steward, the unjust judge, and the friend persuaded by importunity.

The supernatural narratives peculiar to Luke, and found in the main body of his treatise, are the miraculous draught of fishes, the raising of the widow's son at Nain, the healing of the woman bound by Satan, the cure of the dropsical man, and the appearance of the angel strengthening Jesus—(18), (25), (46), (49), (75).

Passing from the main body of Luke's Gospel, we come to the introduction, which name we may give to the first two chapters, describing the birth and childhood of Jesus, and the birth of His forerunner, John, the son of Zacharias. The doctrine of the miraculous incarnation, although distinctly stated in Matthew's Gospel, nevertheless required further confirmation. This doctrine appears to have been spoken of from the earliest time, in language which might give rise to different conclusions, according as it was interpreted literally or metaphorically. For example, in the Apocalypse, "the Man Child who was to rule over all nations with a rod of iron," is said to have been born of a woman who was "clothed with the sun, and the moon under her feet, and upon her head a crown of twelve stars," who, after her son had been "caught up into heaven," fled "into the wilderness, where she hath a place prepared of God." It seems certain that the writer represents by

the woman, not the Virgin Mary, but the Church—the Spiritual Israel; and in later times the letter of the Church of Lyons speaks of the "Virgin Mother" as having her children restored to her from the dead (meaning that the church received back, as martyrs, those, who had first recanted and then renounced their recantation). Justin Martyr also protests that, even though he should not be able to prove the preëxistence of Jesus, and even though it should appear that He was born man of men, yet it would still be true that He is Christ; "for," adds he, in his dialogue with Trypho, "there are some, O my friends, of our race, who confess Him to be Christ, but who declare that He is man of men, to whom I do not assent; nor would very many that have formed the same opinion as I have, say as they say, because we have been commanded by Christ Himself not to follow the teachings of men, but the proclamations made by the blessed prophets, and taught by Him." The expression "not very many," indicates that even in Justin's time (150 A.D.) a large though not very large number of Christians in Samaria or Judea believed that Christ was the son of Joseph, and that a principal part of the evidence for the contrary belief was based upon "the proclamations of the prophets." On the other side, what germs of wild and fanciful doctrine were in the air, may be inferred from the Gospel of the Hebrews, which will not allow that Jesus had even a human mother, but speaks of His mother as being the Holy Spirit. In opposition to these divergent but heterodox beliefs, it became increasingly necessary to maintain the doctrine that Jesus was at once a man, born of a human mother, and divine, born of the heavenly Father; and this needed to be re-affirmed now, during the prosperity of the church, in a somewhat less apologetic tone than characterized the narrative of Matthew.

When we speak of Luke's "supplying the deficiencies of Matthew," we must not be supposed to mean that Luke had before him, or even knew of the existence of, Matthew's Gospel. It has been shown above that he probably knew of no apostolic written narrative. Though Matthew's was probably written some years before Luke's Gospel, very many years might elapse before a treatise used in one church or province might be recognized as authoritative beyond its original boundaries. But by "supplying the deficiencies" we mean that the conscience and faith of the church required in Luke's time some further and more vivid embodiment of the spiritual truth involved in the incarnation than was contained in the unsupplemented narrative of Matthew.

Language of the Original Traditions.—It is probable that the Jews, and more especially those in Galilee, were (like the Welsh in the present day) bilingual; and the question has therefore been raised whether our Lord, in his teaching, spoke Greek or Aramaic. The names Cephas, Boanerges, given by our Lord to His Galilean disciples, and the use of Aramaic in His own prayer ("Abba, Father"), and in His last utterance (as recorded by Mat. xxvii. 46; Mk. xv. 34), indicate that both for Himself and for His disciples Aramaic and not Greek was the natural tongue. Although therefore it cannot be denied that Greek, even in Jerusalem, was generally intelligible, yet the scanty evidence derivable from our Lord's words is that He habitually used Aramaic.

But it has been thought that the use of the LXX. in our Lord's quotations from the Old Testament shows that He spoke Greek. The answer is—(1) Even if all the quotations in the synoptists from the Old Testament exactly agreed with the LXX., the agreement would by no means prove that our Lord used the

LXX.; for, in translating Hebrew into Greek, the translator might naturally translate the Hebrew quotations from the Old Testament into the corresponding LXX. version, to which his readers were accustomed. This he might do, even though the LXX. did not quite accurately represent the Hebrew; just as, in translating into English a Latin book, with quotations from the Vulgate, we should naturally use our English version, without considering whether the English exactly represented the Latin. (2) But, in the second place, there is scarcely a single quotation in the Gospels from the Old Testament that exactly agrees with LXX. when the LXX. differs from the Hebrew; and many of the quotations differ slightly both from the Hebrew and from the LXX., and even from the same quotations as elsewhere occurring in the New Testament. And this is just what we might expect. A Hellenist, translating a Hebrew document into Greek (in times when reference to books was far more cumbersome, and trust to memory far more common, than with us) would be likely to be guided principally by his memory of the LXX., but partly by the Hebrew before him. Hence would result translations slightly varying both from the Hebrew and from the LXX., and from other translations made by contemporaneous writers. This argument is, of course, unaffected whether the translation was originally made in a document or, as is more probable, in an oral tradition.

The difference between the Triple Tradition of Matthew, Mark, and Luke, and the Double Tradition of Matthew and Luke, will occur to us as an important feature in our evidence. The widely different phenomena of the Double and the Triple Traditions suggest different origins for the two traditions. Many of the passages common to Matthew and Luke agree together far more closely than even the Latin versions of the Greek Gospels. It would seem to follow that in such cases Matthew and Luke used one and the same Greek document—a translation of some Aramaic original—which document had not undergone much modification by oral tradition before passing into the several treatises of Matthew and Luke. On the other hand, the more varying language of the Triple Tradition, together with the additions and omissions of the three writers, suggests independent translations of an Aramaic original; occasional resemblances suggested by the general “*usus ecclesiasticus*”; divergences created by the local “*usus ecclesiasticus*,” or by the individual style of the editor or editors.

Date of the Synoptic Writers.—The composite nature of the synoptic Gospels makes it necessary to distinguish carefully between the date of the compilation of each collective treatise and the date of the composition of the several parts of which that treatise may be composed. The original tradition has been shown to have existed before any of the three synoptics; some common document of the words of the Lord has been shown to have probably existed before Matthew's or Luke's narrative; other documents or traditions might also possibly be shown to exist embedded in each of the synoptists, and the date of each of these parts would be earlier than the date of the whole. Therefore, even if the date of Matthew, or Mark, or Luke could be exactly determined, it would by no means determine the date of the traditions which they contain. It is even possible that a later Gospel may retain in some cases an earlier version of the common tradition of the words of the Lord, as we have seen in the case of Luke's version of the Lord's Prayer.

There is no internal evidence for exactly determining the date of any one of the synoptics. The supposed references in Mark to the death of James, the capture of Jerusalem, or any special earthquakes which might determine the date, are so shadowy as scarcely to deserve consideration. The reference to the death of Zachariah,

the son of Baruch, shortly before the capture of Jerusalem, supposed to be found in Mat. xxiii. 35, is still more improbable. Still the marked difference between the detailed prediction of the fall of the city and the scattering of the people, and the more general predictions in corresponding passages in Matthew and Mark, indicates that Luke's description is modified by reminiscences of the siege of Jerusalem; while Matthew's and Mark's accounts are not thus, or at all events not equally, modified. It is an almost certain inference that Luke compiled after 70 A.D. As regards Matthew and Mark inferences cannot be drawn with equal certainty; for, of course, a compiler may compile at a late date, and yet preserve traditions in their earliest shape; but it is at least a reasonable inference that the compilers of the First and Second Gospels wrote before Luke; and there is a balance of probability in favor of the proposition that they wrote before the fall of Jerusalem.

Coming to more general evidence, we find that (1) Mark, at least in many passages, includes the original tradition from which both Matthew and Luke borrowed; (2) his language, less polished than that of Matthew and Luke, appears more natural for an earlier Gospel in the first and rudest age of the church; (3) Mark's version of the tradition contains many expressions which might naturally be considered “*stumbling-blocks*,” and which, in fact, were rejected or not inserted in the other Gospels; (4) the omission of all account of the manifestations of Jesus after the resurrection indicates a very early date; and though it may be said that this omission arises from the fact that the Second Gospel was accidentally left incomplete, yet this answer will not account for the omission of the genealogies, and of all account of the birth and infancy of Jesus; (5) the interpolated appendix describing the resurrection of Jesus, quoted as it is by Irenæus, shows that even in the time of Irenæus (170 A.D.) the Gospel had been long enough in use to admit of widespread interpolations. All these facts lead to the inference that Mark was compiled earlier than any of the other Gospels, and probably some time before 70 A.D. It is almost impossible to fix any date (worth stating) after which the compilation must have taken place. Those who accept as literally true Mark's accounts of the feeding of the four thousand and five thousand, the walking on the waves, and the exorcism of the Gadarene, may naturally carry back his history to the first years of the Galilean church; and even those who interpret these accounts symbolically are ready to admit that a very short space of time is often quite sufficient, by misunderstanding and accretion, to erect supernatural narratives on a basis of natural and symbolic story. But any approximation to a date *after* which the Gospel was compiled must be deferred till we consider the external evidence.

The narrative of Matthew does not leave us quite so uncertain. The mention of “the Jews,” which is so frequent in the Fourth Gospel, is justly regarded as a proof that the author was writing in times when the Christian church was regarded as definitely and antagonistically separated from the Jewish nation. In the synoptists it is the “Pharisees,” not the “Jews,” who are in conflict with Jesus. But in his account of the resurrection Matthew (xxviii. 15) uses the word in this antagonistic sense. Further, he twice (xxvii. 8; xxviii. 15) uses the expression “even to this day,” of events occurring shortly before or after the death of Jesus—thereby showing that a long interval had occurred between the death of Jesus and the compilation of the narrative. The tone of the Gospel, as compared with Luke, indicates a period when the Jews still existed as a nation, and when the abrogation of the law and the

destruction of the temple were not yet accepted as recognized facts; but the number of parables upon the end of the world and the judgment, the tendency to dwell on exclusion rather than inclusion, on the "many" that are shut out rather than on the "few" that are chosen, and the atmosphere of gloom generally characterizing the Gospel, point perhaps to the crisis immediately preceding the siege of Jerusalem. The additions concerning the birth and incarnation may seem to imply a later date; but, when we reflect how natural it was that in very early times the church should attach importance to these subjects, the wonder will be, not that these narratives were written so soon, but that they were deferred to so late a period as forty years after our Lord's death. It is also extremely remarkable—and a mark of early date as compared with Luke—that even in this developed form of the Gospel the accounts of manifestation of our Lord after his resurrection should be so scanty, doubtful, and vague.

In Luke the signs of later date abound:—(1) the pre-existence and implied failure of many "attempts" to set forth continuous narratives of the things "surely believed;" (2) the mention of the "tradition" of the eye-witnesses and ministers of the word as past, not as present *παρέδοσαν* (i. 2); (3) the dedication of the Gospel to a man of rank (fictitious or otherwise), who is supposed to have been "catechized" in Christian truth; (4) the attempt at literary style and at improvement of the "usus ecclesiasticus" of the common tradition; (5) the composition of something like the commencement of a Christian hymnology; (6) the development of the genealogy and the higher tone of the narrative of the incarnation; (7) the insertion of many passages mentioning our Lord as *ὁ κύριος* not in address, but in narrative; (8) the distinction, more sharply drawn, between the fall of Jerusalem and the final coming; (9) the detailed prediction of the fall of Jerusalem, implying reminiscences of its fulfillment; (10) the very great development of the manifestations of Jesus after the resurrection. The inference from all this evidence would be that Luke was not written till about 80 A.D. at earliest. If it could be further demonstrated that Luke used any Greek Apocryphal book (Judith, for example), and if it could be shown that the book in question was written after a certain date (Renan suggests 80 A.D. for the date of the book of Judith), it might be necessary to place Luke much later; but no such demonstration has been hitherto produced.

External Evidence.—The composite nature of the synoptic Gospels will affect the inferences which are drawn from early quotations of passages found in them, where the authors of the Gospels are not expressly mentioned. If, for example, we find in Justin a passage (quoted as a saying of the Lord) which is found both in Matthew and Luke, Justin may indeed have quoted it from Matthew or from Luke; but it is also possible that he may have quoted it neither from Matthew nor from Luke, but either (a) from the common source whence Matthew and Luke derived the passage, or (b) from some other book or tradition, which, like Matthew and Luke, include the passage in its collection or conflation. The same applies to a quotation from the Triple Tradition. It may be quoted from Matthew or from Mark or from Luke; but it is also possible that it may be drawn from none of these, but from the common tradition itself or from some other treatise based on the Triple Tradition.

THE FOURTH GOSPEL.

Authorship.

Evidence from earliest Tradition.—Before considering the subject matter of this Gospel, it will be well to

consider the evidence, direct and indirect, bearing on the authorship. The author is not mentioned in the Gospel by name, but only as "the disciple whom Jesus loved," "which also leaned on His breast," and to whom Jesus commended His mother from the cross. The first writer who mentions John as the author in connection with a passage quoted from our Fourth Gospel is said to be Theophilus, who wrote toward the close of the second century. The Muratorian fragment (170 A.D.) speaks of the apostle as the author of a Gospel, but does not quote from it. But Theophilus quotes John i. 1, as written by John, one of those "inspired by the Spirit." It is a natural inference that Theophilus (at so late a date), using the name thus without further definition, meant by "John," the "John" best known to his readers, *i.e.*, John, the son of Zebedee, the apostle. But there is unusually strong evidence to show that John the apostle wrote the Apocalypse, so strong that we may assume the apostolic authorship of that book with more confidence than the authorship of any other book in the New Testament, except some of Paul's epistles. The question therefore arises, how far does the style of the Gospel, which was said by Theophilus (170–180 A.D.) to have been written by John (presumably the apostle), agree with the style of the Apocalypse, which we have so good reason for believing to have been written by the apostle John? If we assume John to have been four or five years younger than his Master, he would be, according to the commonly received date (68 A.D.) of the Apocalypse, about sixty-seven or sixty-eight years of age when he wrote that work. By that age (one would suppose) an author's style would, if ever, have reached its maturity. Even if he were ten years younger than Jesus, so that he was only a little over sixty years of age, yet his style would not be capable of a complete transformation. But when the Gospel is compared with the Apocalypse, instead of similarity, we find an almost complete contrast. The vocabulary, the forms, the idioms, the rhythm, the thought—all is different. That the Apocalypse and the Fourth Gospel should have been written by the same author would be, we will not say impossible, but one of the most marvelous literary phenomena ever authenticated. The change in Shakespeare's style, or in the style of Burke, cannot be compared with this; for those changes can be in part explained by the transition from youth to maturity or old age. Here we have to explain how a writer could completely change language, style and thought, after the age of sixty or sixty-seven years. It is possible, but *a priori* highly improbable.

External Evidence.—The general conclusion to which we are led by the external evidence of quotations is that, although some of the doctrine of the Fourth Gospel, expressed in words similar to the words of the Fourth Gospel, was probably current in the Ephesian church toward the end of the first half of the second century, yet it was not by that time widely used, if at all, as an authoritative document; nor have we proof that it was so used till the times of Irenæus, *i.e.*, toward the end of the second century, by which time the Gospel was authoritatively quoted as a work of John; and those who so quoted it probably meant by "John" John, the son of Zebedee, the apostle.

Internal Evidence.—The Fourth Gospel compared with the Synoptic Narrative. In estimating the Fourth Gospel as a history, we must necessarily attach a special importance to those portions in it which cover the synoptic ground; for these will afford us the best means of judging how far the facts of the life of Christ, as well as the language of Christ, may have been transmitted by the author. We will therefore first consider those parts of the Fourth Gospel which afford us an

opportunity of comparing it with the Gospels of the synoptists.

The first point of comparison is the greater scope of the Fourth Gospel as compared with the other three. It includes all past time in its prologue, and exhibits the incarnation of the divine Word as but one act in the drama of the universe.

Nor is its scope in space narrower than in time. The limited scenery of the synoptic stage—Galilee, Samaria, Judea,—is (in spirit, though not in letter) exchanged here for "the world." As Philo tells us that the tabernacle figured the universe, and that the robes of the high priest represented (*Moses*, iii. 12) the different parts of the world, so the High Priest of the Fourth Gospel, though speaking or working in a narrow province of Syria, is always regarded as officiating at the altar steps of the universe, and bearing with Him the destinies of humanity. "The world" is continually on His lips; and John the Baptist is made to proclaim, even at the very outset of the Messiah's career, that the Lamb of God will take away the sins, not of "the Jews," but of "the world." It is true that Judaism is not ignored. Prophecy is constantly appealed to; and the motive of the Gospel is undoubtedly to show that Jesus is "the Christ," as well as to show that He is the Son of God. Yet nowhere in the Fourth Gospel is found any marked distinction between the Gentiles and Samaritans on the one side and the Jews on the other, as if the former must be neglected for a time, and as if the latter were entitled to priority in the offer of salvation; on the contrary, Christ is described, early in the narrative, as preaching to the Samaritans, and the Samaritan faith (far more general than the isolated case of the Samaritan leper in Luke) serves as a foil to the Jewish unbelief. "The Jews," so far as they are distinguished from others, appear throughout as a nation with whom the writer has no sympathy, as the emblem of rebellious, unspiritual skepticism. Viewing the drama at a greater distance of time than the synoptists, and purposely withdrawing himself to a still more subjectively distant point of view, for the purpose of unity and compression, the author almost ignores the minor distinctions of Pharisees, Sadducees, Herodians, scribes, and lawyers, with which the synoptists have made us familiar. Palestine is seen no longer with the distinctions of a neighboring diversified coast-line, but like a dark mass upon the horizon of the distant East, serving as a foil to the splendor of the rising Sun of Righteousness, which it strives in vain to obscure.

In the miraculous part of our evangelist's narrative especially, there is visible this artistic power of selection and compression. Few miracles are described, not more than eight in all (including the post-resurrection miracle of the draught of fishes), and among these not a single case of exorcism. The element of mere wonder is carefully subordinated to the symbolical element. It is true that the whole Gospel breathes a supernatural atmosphere. Although the *Logos*, becoming "flesh," is immediately afterward called Jesus or the Son, and is never henceforth mentioned by the name *Logos* throughout the whole of the Gospel, yet in reality it is still the *Logos*, rather than Jesus, that is described in the following pages.

The Motive of the Fourth Gospel Illustrated by the First Epistle of John.—It has been said above that the First Epistle of John is most closely connected with the Gospel. The connection is so close, in thought as well as in language, that the former may almost be called a summary of the latter. In the Epistle, even more clearly than in the Gospel, we see the author's habit of dealing rather with elements than with nations or individuals. With the exception of the illustration

of "Cain," which he possibly borrowed from Philo (who uses Cain and Abel to denote the earthly and the spiritual principle, *Sacrifices of Cain and Abel*, 1), he prefers to dispense with personal illustrations of principles. He does not, like Paul, speak of Abraham, or Hagar, or Sinai, or Isaac, or Melchisedek, or the Jews, or the Gentiles, but of the world and the flesh, the water, the blood and the spirit, light and darkness, life and death. In the Epistle, as in the Gospel, we see the rejection of Christ explained, not as a casual outcome of individual caprice or wickedness, but as an inevitable result of the eternal antagonism between light and darkness. In the Epistle, as in the Gospel, the author insists that the new commandment of Christ to "love one another" is really an old commandment which men have had from the beginning: a commandment as old as the promptings of the Light which, from the beginning, has "lighted every man coming into the world"—an old commandment only so far made new as it has been brought home to the hearts of men with a quite new intensity by the manifestation of the incarnate Love of God. In the Epistle, as in the Gospel, it is recognized that the antagonism between the world and the spirit, between light and darkness, must go on without truce till one has prevailed, and each man must take one or other side, putting away all hope of compromise.

In this continuous strife between light and darkness the victory is to be gained by faith, but faith supported by witnesses; and we read in the Epistle that the object of our victorious faith is "He that came through water and blood, Jesus Christ; not with the water only, but with the water and the blood; and the Spirit is that which beareth witness, because the Spirit is truth; because they that bear witness are three, the spirit (or breath), and the water, and the blood, and the three are united so as to make up the one."

Passing over many differences of interpretation, and asking, what is the meaning of the water and the blood? we turn to the Gospel, and, in the account of the crucifixion, we find especial stress laid upon the fact that from the side of Jesus "there came out blood and water; and he that hath seen hath borne witness, and his witness is genuine, and he knoweth that he saith true, that ye might believe." In what sense is the "blood" here to be understood? As nourishing? or as cleansing? Almost certainly as cleansing; because above, in this very Epistle, the blood of Jesus is described as cleansing us from all sin. Inferring, then, that the blood signifies a superior purifying or baptismal influence, we necessarily infer simultaneously that the water signifies an inferior baptismal influence. Two purifications are mentioned in all the four gospels, an inferior and preparatory, and a superior and final; the former is the baptism with water, the latter is the baptism with the Holy Spirit, or with the Holy Spirit and fire. But the conception of "baptism with fire," though it is based on the early history of Israel, and appears occasionally in the shape of a "fiery trial" of faith, as well as in the fiery tongues of Pentecost—was soon supplanted by one of two other conceptions, either sprinkling with sacrificial blood, or baptism with the Spirit. This higher purification, or baptism with blood, Jesus brought into the world. He not only came working by means of it, but also, in a certain sense, in it. That is to say, He himself underwent the higher baptism with blood as well as the lower purification with water, which He received from John the Baptist. The agony in Gethsemane, which was that baptism, was typified by Luke in an exudation of "sweat, as it were great drops of blood falling down to the ground." But this baptism was scarcely public enough to be a sufficient fulfillment of the prophecy which predicted that "In that day

there shall be a fountain opened to the house of David, and to the inhabitants of Jerusalem, for sin and for uncleanness." When it became recognized that the Lord was this "fountain," and that His blood was the cleansing stream, then the piercing of his side and the visible emission of the purifying blood from the wound became an effective and almost necessary type of the spiritual purification, and the type of the blood of sprinkling, suggested perhaps by Luke in his description of the agony, fell into the background, being supplanted by the more natural type of the pierced side.

Such a type would all the more commend itself, because, without it, the crucifixion might almost seem incomplete. The mere piercing of the hands and the feet might seem an insufficient fulfillment of the prophecy of the "fountain;" and besides, since crucifixion was generally a lingering death extending over many hours, and since the body of Jesus was taken down on the same day on which it had been attached to the cross (and, according to John, only three or four hours after the commencement of the crucifixion), the record of His death, without the spear wound, might seem to justify the statements of those who maintained that Christ never died at all, and that He was a man only in appearance. Therefore, as a proof of His humanity and of the reality of His death and sufferings, no less than as a fulfillment of the prophecy of the "fountain," it was natural that the latest Gospel should insert, and that the church should readily accept, the witness through blood as well as water, which is so emphatically related by the author of the Gospel, and here appealed to by the author of the Epistle.

It is probable that the Gospel originally ended at xx. 31: "But these are written that ye might believe that Jesus is the Christ the Son of God, and that believing ye might have life through His name." This is a most appropriate termination; and what follows bears every appearance of being an appendix added by the author, describing a miraculous draught of 153 fishes, and a meal of Jesus with seven of the disciples, followed by a dialogue between Jesus and Peter, in which the death of the latter is predicted, and the erroneous tradition that the beloved disciple should not die is shown to be baseless.

Three inferences seem probable from this last narrative: (1) that there had been at Ephesus a tradition (arising perhaps from the extreme old age of John and from some such expression as is recorded in John xxi. 22) that John would not die till the Lord had appeared; (2) that John had died when this account was written (for if he were living and past his ninetieth year, at a time when the church daily expected the coming of the Lord, the Ephesian Christians would not have needed any explanation or softening away of a prediction which would seem to them very likely to be fulfilled); but (3) if John was dead, it must seem that the words "we know" could not have been added (as they might be supposed to have been added, according to the Muratorian legend) by Andrew and Philip, who in all probability died before John died; and if John was dead, it must seem that the words *would* not have been added by any elders of Ephesus representing the generation after John; for how could they—who stood on a footing altogether subordinate and inferior in point of reputation, and with no opportunities of information—have ventured to ratify the testimony of the "beloved disciple"?

It is more easy to arrive at negative than at positive results, when evidence is so slight; but it seems probable that the author, attempting to give the spiritual essence of the gospel of Christ, as a gospel of love, and assigning the Ephesian Gospel to the beloved disciple who had presided over the Ephesian church, by way of

honor and respect (for the same reasons which induced the author of the 2d Epistle of Peter to assign that Epistle to the leading apostle), and being at the same time conscious that the book (though representing the Ephesian doctrine generally, and in part the traditions of John the apostle, as well as those of Andrew, Philip, Aristion and John the elder) did not represent the exact words and teaching of the disciple—added the words "We know," etc., partly as a kind of *imprimatur* of Andrew, Philip and the rest; partly in order to imply that other traditions besides those of John are set forth in the book; partly to characterize the book as a Gospel of broader basis and greater authority than the less spiritual traditions issuing from non-apostolic authors, which our evangelist desired to correct or supplement. Nor is it in the least unlikely that this Gospel does represent the teaching of Andrew and Philip, and Aristion and John the elder, as well as that of John. If Papias of Hierapolis gathered up the traditions of these apostles and elders, why not also our author, writing in Ephesus perhaps several years before Papias? It is assuredly not for nothing that the name of "Matthew," mentioned in Matthew, Mark and Luke, is not found in the Fourth Gospel; nor is it without significance that the Gospel begins and ends with an inner apostolic circle. The "twelve" are indeed mentioned, but as in the background. The beloved disciple, Andrew and Peter, Philip and Nathanael—these, and these only, are mentioned as called by Jesus in the beginning; Peter and Thomas, Nathanael and the sons of Zebedee, and two other disciples (presumably the same list as those above, with the addition of James, the son of Zebedee, and Thomas), are mentioned as alone admitted to the sacred meal which closes the Gospel. This fact marks the whole character of the book; it is esoteric and eclectic, and designedly modifies the impression produced by the tradition previously recorded by the synoptics.

GOSPORT, a fortified seaport and market town of Hampshire, England, on the western side of Portsmouth harbor, near its mouth, directly opposite and about a mile from Portsmouth, with which it is connected by a floating bridge moved by a steam engine working on two fixed chains.

GOSSART, JAN, born at Maubeuge toward the close of the fifteenth century, is better known by the name of Mabuse than by that of Jenni Gossart, with which he signed some of his pictures, or that of Jennyn van Henegouwe (Hainault), under which he matriculated in the guild of St. Luke, at Antwerp, in 1503. We know nothing of his life before he attained to manhood; but his works at least tell us that he stood in his first period under the influence of artists to whom plastic models were familiar; and this leads to the belief that he spent his youth on the French border rather than on the banks of the Scheldt. Philip of Burgundy ordered Mabuse to execute a replica for the church of Middleburg; and the value which was then set on the picture is apparent from the fact that Diirer came expressly to Middleburg (1521) to see it. In 1568 the altar-piece perished by fire.

Van Mander's biography accuses Gossart of habitual drunkenness; yet it describes the splendid appearance of the artist as, dressed in gold brocade, he accompanied Lucas of Leyden on a pleasure trip to Ghent, Malines, and Antwerp in 1527. The works of Mabuse are those of a hardworking and patient artist; the number of his still extant pictures practically demonstrates that he was not a debauchee. The marriage of his daughter with the painter Henry Van der Heyden of Louvain proves that he had a home, and did not live habitually in taverns, as Van Mander suggests. His death at Antwerp, on October 1, 1532, is recorded in the portrait engraved by Jerome Cock.

GOSELIES, a town of Belgium, in the arrondissement of Charleroi, and province of Hennegau, is picturesquely situated on the Piéton and on the Brussels and Charleroi canal, eight miles northwest from Charleroi. Population (1901), about 9,000.

GOTHA (originally *Gotegeve*, or *Gotawe*, and later *Gotaha*, or *Gothau*), a town of Germany, formerly capital of the old duchy of Gotha, and now, alternately with Coburg, the residence of the duke of Saxe-Coburg-Gotha, is situated on a canal of the Leina, and on the Thuringian railway, about six miles north of the Thuringian Forest. It consists of the town proper and four suburbs, which are grouped in the shape of a half-moon to the north, west, and east of the hill on which, at the height of 1,086 feet, stands the castle of Friedenstein. With the exception of those in the older portion of the town, the streets are handsome and spacious, and the beautiful gardens and promenades between the suburbs and the castle add greatly to the town's attractiveness. Gotha is one of the most active commercial towns of Thuringia, its manufactures including sausages, for which it has a great reputation, porcelain, tobacco, sugar, machinery, mechanical and surgical instruments, musical instruments, shoes, lamps, and toys. The book trade is represented by about a dozen firms, including that of the great geographical house of Perthes. Population, (1900), 34,651.

GOTHENBURG (Swedish, *Göteborg*), the second city and chief commercial town of Sweden, and the capital of a "län" of the same name, is situated in a low valley surrounded by bare hills, on the south bank, and one and two-thirds miles from the mouth of the Götha river, 282 miles west-southwest of Stockholm by rail (by the Götha Canal, 370 miles). Gothenburg is well and regularly built, mostly of stone or brick, with wide and well-paved streets, and, in its general appearance, much resembles an English town. The population of Gothenburg, including suburbs, was 130,619 in 1900.

GOTHIC LANGUAGE. See under **GOTHS**.

GOTHOFRED, or **GODEFROY**, the name of a noble French family, of which many members attained distinction as jurists or historians.

The first whose name is associated with the active study of jurisprudence, at the close of the sixteenth century, was **DENIS GODEFROY** (1549–1621). His most important work is his edition of the *Corpus Juris*. The text given by him was very generally adopted and used in quotation. More than twenty editions of the work were published in various towns of France, Germany and Holland. Godefroy's other writings are very numerous; but they are for the most part either editions of classical authors or compilations which display great industry and learning, but are of little use to the modern student.

THEODORE GODEFROY (1580–1649), the eldest son of Denis, forsook the religion which his father had adopted, and obtained the office of historiographer of France, as well as several important diplomatic posts. His historical works are very numerous. The character of his labors will be judged from the title of his most elaborate production—*Le Cérémonial de France*. Many of his smaller works are devoted to questions of genealogy.

JACQUES GODEFROY (1587–1652), the younger brother of Theodore, has a real claim to the remembrance of students of the history of Roman law, in his edition of the *Theodosian Code*, at which he labored for thirty years. It was this code, and not the *Corpus Juris* prepared under the direction of Justinian, which formed the principal, though not the only source from which the lawyers of the various countries which had formed the Western empire drew their knowledge of Roman law, at all events until the revival of the study of law in the eleventh century at Bologna.

GOTHS. The historical position of the Gothic nation needs to be marked out with special care, both on account of various lax popular uses of the Gothic name, and also on account of much legendary history and many rash ethnological speculations, ancient and modern, which have gathered round the true history of the Gothic people. An ignorant age used the words *Goth* and *Gothic* as vague names of contempt for anything that was thought rude and barbarous. A hardly less ignorant but better disposed age used the word *Gothic* in an equally vague way, but without the same feeling of contempt for anything which was thought to be mediæval or "romantic," as opposed to "classical." The name came also to be used as a philological or ethnological term; we heard of "Gothic nations," "Gothic languages," etc., meaning "Teutonic" in the widest sense. The name was also, first scornfully, then respectfully, applied to a style of architecture which has some claim to be called Teutonic as opposed to Greek or Roman, but which has nothing whatever to do with the Goths as a nation. Long before this, two European sovereigns who had nothing whatever to do with the national Goths, took the title of King of the Goths out of a mere accidental likeness of names. All these uses of the Gothic name must be carefully distinguished from the history of the true national Goths, who play so great a part in Europe from the third to the eighth century of our era. The Goths may on many grounds claim the foremost place among the Teutonic nations which had a share in the break-up of the Roman power. They were among the earliest, if not quite the earliest, of the Teutonic nations to establish themselves within the empire, as distinguished from merely ravaging its frontiers. Their history, too, is closely connected with the geography of the whole empire. Their first historical appearance was in the East; their great historical settlements were made in the West. No Teutonic people fills so great a place in the political and military history of the fourth, fifth, and sixth centuries, and no Teutonic people has left behind it such early remains of a written native literature. The real greatness of the Goths quite accounts for the many vague uses of the Gothic name. Alike in scorn and in honor, the Goths have been, not unreasonably, taken as the representatives of the whole Teutonic race. The wonderful thing is that a people who played so great a part for several ages should have wholly passed away. The Goths have not for many ages existed anywhere as a distinct nation, nor have they given an abiding name to any part of Europe. Franks, Angles, Saxons, Burgundians, Frisians, Thuringians, Lombards, Bavarians, perhaps Vandals, are all visible on the modern map. So several parts of Europe have at different times been known as *Gothia*; but the name was never borne by any large country, and it has nowhere lasted down to modern times.

The chief early authority for the early history of the Goths is their national historian Jordanis, who chiefly followed the Gothic history of Cassiodorus, the minister of Theodoric, and the lost history of Ablavius.

The first certain historical appearance of the Goths is in the lands north of the lower Danube in the third century of our era. For any earlier account of them we have to go either to mythical stories or to ingenious guesses and inferences. There are a remarkable number of national and legendary names which have more or less of likeness to the name *Goth*; and this likeness has naturally led to an unusual number of theories. The Goths first appear in history in the ancient land of the *Gelte*; and this geographical fact, combined with the likeness of the names, has naturally caused *Gelte* and *Goths* to be looked on as the same people. The

Identification is as old as our first historical mention of the Goths. Claudian always speaks of the Goths as *Getae*. So does the national historian Jordanis. The identity is mentioned doubtfully by Procopius. It is strongly maintained by Jacob Grimm, but is rejected by nearly all later writers. A more famous legend, which has derived its chief currency from Jordanis, brings the Goths first of all from Scandinavia. There is a so-called East and West Gothland in Sweden, but the connection of these lands with the Goths of Roman history is more than doubtful.

On the whole, it seems that there is no trustworthy evidence of a migration of the Goths from Scandinavia, and that the idea was suggested only by the likeness of name between the true Goths and the *Gauts* or *Gedtas* of Swedish history. The application of the name *Gothland* to the island *Gotland*, as well as to the continental *Gauthiod*, is a further mistake. Nor does there seem to be any reason for making *Goths* and *Getae* the same. But the identification of the Goths with the *Gothones*, *Γούθονες*, *Guttones*, on the south coast of the Baltic (which is accepted by Pallmann and Dahn) has much more to be said for it. *Gothi* and *Gothones* are strictly the same name; the double form is usual in the Latin shapes of Teutonic names. The continuous and certain history of the Gothic nation begins in the Roman Dacia.

The history of the East and West Goths, as far as the empire is concerned, falls naturally into three periods. In the third century they are still settled outside the empire, and appear as invaders and ravagers of the Roman territory from outside. After an interval in which they almost sink out of notice, they appear again within the bounds of the empire, in various relations of alliance and enmity, marching to and fro, but not making any lasting settlement. It is not till the fifth century that they begin to form settled powers. During their wandering stage they appear mainly in the Eastern empire. But neither they nor any other Teutonic people founded any permanent settlement within its borders. The historical settlements of the Goths are the short and brilliant dominion of the East Goths in Italy, and the more lasting dominion of the West Goths in Gaul and Spain.

After the first vague mention of the Goths under Antoninus Caracalla, they begin to play a distinct part in the reign of Alexander Severus. They were then in Dacia, and received a tribute or subsidy of some kind (Petrus Patricius, 124, ed. Bonn). The next emperor, Maximin, is claimed by Jordanis (15) as himself of Gothic birth, but we may suspect the usual confusion with the *Getae*. The narrative of Jordanis begins from this point to put on a more historical character, and his account is helped out by various notices in the Augustan history. In the reign of Philip (244-248 A.D.) they passed the Danube and ravaged Moesia, and in 251 the emperor Decius fell in battle against them. From this time they ravaged eastern Europe and western Asia far and wide (251-268). They carried on their warfare by sea, and reached as far east as Trebizond. And it seems to have been now that the first permanent Gothic settlement was made, though not strictly within the lands of the empire. This was in the Tauric Chersonesus or Crim. Here their settlement lasted for many ages, and they became allies rather than subjects of the empire in the reign of Justinian. Within the empire the Gothic inroads met with repulses at several points, especially from the local forces of Athens under the historian Dexippus. At last, in 269, the Goths suffered a decisive defeat from the emperor Claudius, at Naissus, in Dardania, which formed an epoch in Gothic history. It answers to the repulse of

the Saxons from Britain by the elder Theodosius. The first attempt at Gothic settlement south of the Danube had been premature. It had to be repeated at a later time with greater success.

Further victories over the Goths are attributed to Aurelian. But the chief event of his reign was one which amounted to a legal acknowledgement of Gothic occupation north of Danube. The Roman legions were withdrawn from Dacia, and the name of Trajan's great conquest was transferred to the land south of the Danube (274). That is, the great river was established as the boundary between the Roman and Gothic dominions. The wisdom of this cession is shown by its being followed by a period of ninety years in which the peace between the Goths and the empire was seldom seriously broken. The chief interruption was during the reign of Constantine, when the Gothic king Araric invaded the empire, and, after some momentary successes, was driven back. In the middle of the fourth century a great power arose under the East-Gothic king Ermanaric (less correctly *Hermanric*; the name is the same as *Eormenric*, in the royal line of Kent), of the house of the Amali, which was reckoned to be the noblest among the Goths. Yet there is something unsatisfactory in the way in which we read vague accounts of the greatness of his power, with hardly a glimpse of himself personally. The period assigned to his reign is full of stirring events, in which we get a clear conception of much lesser Gothic chiefs, but none of Ermanaric himself. Jordanis claims for him a vast dominion stretching from the Danube to the Baltic, and he is specially emphatic on the subjection of the Slavonic nations to the rule of the Gothic overlord. With regard to the Gothic nations, we can see that the rule of Ermanaric was a mere overlordship. The West-Goths appear as a distinct people, with the power of making war and peace on their own account. According to the view of some modern writers the outlying Gothic settlement in Crim had been Christian and Catholic from the beginning; but toward the end of the fourth century Christianity in its Arian form began to be gradually accepted by the great mass of the Gothic nations. This was mainly the work of the teaching of Ulfila (see ULPILA), the Gothic apostle and translator of the Scriptures into the Gothic tongue. The distinction between Christian and heathen Goths remains of political importance for some time. But both East and West Goths had fully embraced Arianism long before the end of the fifth century, while the Goths of Crim seem to have remained Catholic, and received Catholic bishops from Saint John Chrysostom, and afterward from Justinian.

Toward the end of the reign of Ermanaric several causes joined together to break his great dominion asunder. There were clearly signs of division between East and West Goths, between Christians and heathens, as well as discontents among the subject nations. These causes of division were now strengthened by pressure from without. Now began the first of those movements of the Turanian races into the lands north of the Danube, which have had such an effect on the history of southeastern Europe down to our own time. The Huns pressed on the new dominion of the Goths, which was already beginning to break in pieces. Ermanaric died at the age, it is said, of 110, by the hands of subject princes stirred to wrath by his cruelties (Jordanis, 24). All thought of a lasting Gothic dominion north of the Danube died with him. With his fall the movements south of that river began again on a great scale.

From this time the history of the East and West Goths parts asunder, to be joined together again only

incidentally and for a season. The great mass of the East-Goths stayed north of the Danube, and passed under the overlordship of the Hun. They do not for the present play any important part in the affairs of the empire. The great mass of the West-Goths crossed the Danube into the Roman provinces, and there played a most important part in various characters of alliance and enmity. The great migration was in 376, when they were allowed to pass as peaceful settlers under their chief Frithigern. His rival Athanaric seems to have tried to maintain his party for a while north of the Danube in defiance of the Huns; but he had presently to follow the example of the great mass of the nation. The peaceful designs of Frithigern were meanwhile thwarted by the ill-treatment which the Goths suffered from the Roman officials, which led first to disputes and then to open war. In 378 the Goths won the great battle of Adrianople, in which the emperor Valens was killed. His successor, Theodosius the Great, made terms with them in 381, and the mass of the Gothic warriors entered the Roman service as *federati*. Many of their chiefs were in high favor; but it seems that the orthodox Theodosius showed more favor to the still remaining heathen party among the Goths than to the larger part of them who had embraced Arian Christianity. Athanaric himself came to Constantinople in 381; he was received with high honors, and had a solemn funeral when he died.

The death of Theodosius in 395 broke up the union between the West-Goths and the empire. Dissensions arose between them and the ministers of Arcadius; the Goths threw off their allegiance, and chose Alaric as their king. This was a restoration alike of national unity and of national independence. The royal title had not been borne by their leaders in the Roman service. Alaric's position is quite different from that of several Goths in the Roman service, who appear as simple rebels. His whole career was taken up with marchings to and fro within the lands, first of the Eastern, then of the Western empire. The Goths are under him an independent people under a national king; their independence is in no way interfered with if the Gothic king, in a moment of peace, accepts the office and titles of a Roman general. But under Alaric the Goths make no lasting settlement. In the long tale of intrigue and warfare between the Goths and the two imperial courts which fills up this whole time, cessions of territory are offered to the Goths, provinces are occupied by them, but as yet they do not take root anywhere; no Western land as yet becomes *Gothia*. Alaric's designs of settlement seem in his first stage to have still kept east of the Adriatic, in Illyricum, possibly in Greece. Toward the end of his career his eyes seem fixed on Africa.

Greece was the scene of his great campaign in 396, the second Gothic invasion of that country. In this campaign the religious position of the Goths is strongly marked. The Arian appeared as an enemy alike to the pagan majority and the Catholic minority; but he came surrounded by monks, and his chief wrath was directed against the heathen temples. His Italian campaigns fall into two great divisions, that of 402-3, when he was driven back by Stilicho, and that of 408-10, after Stilicho's death. In this second war he thrice besieged Rome (408, 409, 410). The second time it suited a momentary policy to set up a puppet emperor of his own, and even to accept a military commission from him. The third time he sacked the city, the first time since Brennus that Rome had been taken by an army of utter foreigners.

Under Ataulf, the brother-in-law and successor of Alaric, another era opens, the beginning of enterprises

which did in the end lead to the establishment of a settled Gothic monarchy in the West. The position of Ataulf is well marked by the speech put into his mouth by Orosius. He had at one time dreamed of destroying the Roman power, of turning *Romania* into *Gothia*, and putting Ataulf in the stead of Augustus; but he had learned that the world could be governed only by the laws of Rome, and he had determined to use the Gothic arms for the support of the Roman power. And in the confused and contradictory accounts of his actions we can see something of this principle at work throughout. Gaul and Spain were overrun both by barbarian invaders and by rival emperors. The sword of the Goth was to win back the lost lands for Rome. And, amid many shiftings of allegiance, Ataulf seems never to have wholly given up the position of an ally of the empire. His marriage with Placidia, the daughter of the great Theodosius, was taken as the seal of the union between Goth and Roman, and, had their son Theodosius lived, a dynasty might have arisen uniting both claims. But the career of Ataulf was cut short at Barcelona in 415, by his murder at the hands of another faction of the Goths. The reign of Sigeric was momentary. Under Wallia in 418 a more settled state of things was established. The empire recovered again, as the prize of Gothic victories, the *Tarraconensis* in Spain, and *Novempopulana* and the *Narbonensis* in Gaul. The "second Aquitaine," with the sea-coast from the mouth of the Garonne to the mouth of the Loire, became the West-Gothic kingdom of Toulouse. The dominion of the Goths was now strictly Gaulish, their lasting Spanish dominion does not yet begin.

The reign of the first West-Gothic Theodoric (418-451) shows a shifting state of relations between the Roman and Gothic powers; but, after defeats and successes both ways, the older relation of alliance against common enemies was again established. At last Goth and Roman had to join together against the common enemy of Europe and Christendom, Attila the Hun. But they met Gothic warriors in his army. By the terms of their subjection to the Huns, the East-Goths came to fight for Attila against Christendom at Châlons, just as the Servians came to fight for Bajazet against Christendom at Nicopolis. Theodoric fell in the battle (451). After this momentary meeting, the history of the East and West Goths again separates for a while. The kingdom of Toulouse grew within Gaul at the expense of the empire, and in Spain at the expense of the Suevi. Under Euric (466-488) the West-Gothic power again became largely a Spanish power. The kingdom of Toulouse took in nearly all Gaul south of the Loire and west of the Rhone, with all Spain, except the northwest corner, which was still held by the Suevi. Provence alone remained to the empire. The West-Gothic kings largely adopted Roman manners and culture; but, as they still kept to their original Arian creed, their rule never became thoroughly acceptable to their Catholic subjects. They stood therefore at a great disadvantage when a new and aggressive Catholic power appeared in Gaul through the conversion of the Frank Chlodwig. Toulouse was, as in days long after, the seat of an heretical power, against which the forces of northern Gaul marched as on a crusade. In 507 the West-Gothic king Alaric fell before the Frankish arms at Boulogne, near Poitiers, and his kingdom, as a great power north of the Alps, fell with him. That Spain and a fragment of Gaul still remained to form a West-Gothic kingdom was owing to the intervention of the East-Goths under the rule of the greatest man in Gothic history.

When the Hunnish power broke in pieces on the death of Attila, the East-Goths recovered their full in-

dependence. They now entered into relations with the empire, and were settled on lands in Pannonia. During the greater part of the latter half of the fifth century, the East-Goths play in southeastern Europe nearly the same part which the West-Goths played in the century before. They are seen going to and fro in every conceivable relation of friendship and enmity with the Eastern Roman power, till, just as the West-Goths had done before them, they pass from the East to the West. They are still ruled by kings of the house of the Amali, and from that house there now steps forward a great figure, famous alike in history and in romance, in the person of Theodoric, son of Theodemir. Born about 454, his childhood was spent at Constantinople as a hostage, where he was carefully educated. The former part of his life is taken up with various disputes, intrigues, and wars within the Eastern empire, in which he has as his rival another Theodoric, son of Triarius, and surnamed Strabo. This older but lesser Theodoric seems to have been the chief (not king) of that branch of the East-Goths which had settled within the empire at an earlier time. Theodoric the Great, as he is sometimes distinguished, is sometimes the friend, sometimes the enemy, of the empire. In the former case he is clothed with various Roman titles and offices, as patrician and consul; but in all cases alike he remains the national East-Gothic king. It was in both characters together that he set out in 488, by commission from the emperor Zeno, to recover Italy from Odoacer. By 493 Ravenna was taken; Odoacer was killed by Theodoric's own hand; and the East-Gothic power was fully established over Italy, Sicily, Dalmatia, and the lands to the north of Italy. In this war the history of the East and West-Goths begins again to unite, if we may accept the witness of one writer (Anon. Vales. 728) that Theodoric was helped by West-Gothic auxiliaries. The two branches of the nation were soon brought much more closely together, when, through the overthrow of the West-Gothic kingdom of Toulouse, the power of Theodoric was practically extended over a large part of Gaul and over nearly the whole of Spain. A time of confusion followed the fall of Alaric, and, as that prince was a son-in-law of Theodoric, the East-Gothic king stepped in as the guardian of his grandson Amalaric, and preserved for him all his Spanish and a fragment of his Gaulish dominion. Toulouse passed away to the Frank; but the Goth kept Narbonne and its district, the land of Septimania—the land which, as the last part of Gaul held by the Goths, kept the name of *Gothia* for many ages. While Theodoric lived, the West-Gothic kingdom was practically united to his own dominion. He seems also to have claimed a kind of protectorate over the Teutonic powers generally, and, indeed, to have practically exercised it, except in the case of the Franks.

The East-Gothic dominion was now again as great in extent, and far more splendid, than it could have been in the time of Ermanaric. But it was now of wholly different character. The dominion of Theodoric was not a barbarian but a civilized power. His two-fold position ran through everything. He was at once national king of the Goths, and successor, though without any imperial titles, of the Roman emperors of the West. The two nations, differing in manners, language and religion, lived side by side on the soil of Italy; each was ruled according to its own law, by the prince who was, in his two separate characters, the common sovereign of both. The picture of Theodoric's rule is drawn for us in the state papers drawn up in his name and in the names of his successors by his Roman minister Cassiodorus. The Goths seem to have been thick on the ground in northern Italy; in the south they formed little more than garrisons. In Theodoric's

theory the Goth was the armed protector of the peaceful Roman; the Gothic king had the toil of government, while the Roman consul had the honor. All the forms of the Roman administration went on, and the Roman polity and Roman culture had great influence on the Goths themselves. The rule of the prince over two distinct nations in the same land was necessarily despotic; the old Teutonic freedom was necessarily lost. Such a system as that which Theodoric established needed a Theodoric to carry it on. It broke in pieces after his death.

On the death of Theodoric (526) the East and West Goths were again separated. The few instances in which they are found acting together after this time are as scattered and incidental as they were before. Amalaric succeeded to the West-Gothic kingdom in Spain and Septimania. Provence was added to the dominion of the new East-Gothic king Athalaric, the grandson of Theodoric through his daughter Amalasontha. The weakness of the East-Gothic position in Italy now showed itself. The long wars of Justinian's reign (535-555) recovered Italy for the empire, and the Gothic name died out on Italian soil. The chance of forming a national state in Italy by the union of Roman and Teutonic elements, such as those which arose in Gaul, in Spain, and in parts of Italy under Lombard rule, was thus lost. The East-Gothic kingdom was destroyed before Goths and Italians had at all mingled together. The war of course made the distinction stronger; under the kings who were chosen for the purposes of the war national Gothic feeling had revived. The Goths were now again, if not a wandering people, yet an armed host, no longer the protectors but the enemies of the Roman people of Italy. The East-Gothic dominion and the East-Gothic name wholly passed away. The nation had followed Theodoric. It is only once or twice after his expedition that we hear of Goths, or even of Gothic leaders in the eastern provinces. From the soil of Italy the nation passed away almost without a trace, while the next Teutonic conquerors stamped their name on the two ends of the land, one of which keeps it to this day.

The West-Gothic kingdom lasted much longer, and came much nearer to establishing itself as a national power in the lands which it took in. But the difference of race and faith between the Arian Goths and the Catholic Romans of Gaul and Spain influenced the history of the West-Gothic kingdom for a long time. The Arian Goths ruled over Catholic subjects, and were surrounded by Catholic neighbors. The Franks were Catholics from their first conversion; the Suevi became Catholics much earlier than the Goths. The African conquests of Belisarius gave the Goths of Spain, instead of the Arian Vandals, another Catholic neighbor in the form of the restored Roman power. The Catholics everywhere preferred either Roman, Suevian, or Frankish rule to that of the heretical Goths; even the unconquerable mountaineers of Cantabria seem for a while to have received a Frankish governor. In some other mountain districts the Roman inhabitants long maintained their independence, and in 534 a large part of the south of Spain, including the great cities of Cadiz, Cordova, Seville, and New Carthage, was, with the good will of its Roman inhabitants, reunited to the empire, which kept some points on the coast as late as 624. That is to say, the same work which the empire was carrying on in Italy against the East-Goths was at the same moment carried on in Spain against the West-Goths. But in Italy the whole land was for a while won back, and the Gothic power passed away forever. In Spain the Gothic power outlived the Roman power, but it outlived it only by itself becoming in some meas-

ure Roman. The greatest period of the Gothic power as such was in the reign of Leovigild (567-586). He reunited the Gaulish and Spanish parts of the kingdom which had been parted for a moment; he united the Suevian dominion to his own; he overcame some of the independent districts, and won back part of the recovered Roman province in Southern Spain. He further established the power of the crown over the Gothic nobles, who were beginning to grow into territorial lords. The next reign, that of his son, Recared, (586-601), was marked by a change which took away the great hindrance which had thus far stood in the way of any national union between Goths and Romans. The king and the greater part of the Gothic people embraced the Catholic faith. A vast degree of influence now fell into the hands of the Catholic bishops; the two nations began to unite; the Goths were gradually Romanized, and the Gothic language began to go out of use. In short, the Romance nation and the Romance speech of Spain began to be formed. The Goths supplied the Teutonic infusion into the Roman mass. The kingdom, however, still remained a Gothic kingdom. "Gothic," not "Roman" or "Spanish," is its formal title; only a single late instance of the use of the formula "regnum Hispanicum" is known. In the first half of the seventh century that name became for the first time geographically applicable by the conquest of the still Roman coast of southern Spain. The empire was then engaged in the great struggle with the Avars and Persians, and, now that the Gothic kings were Catholic, the great objection to their rule on the part of the Roman inhabitants was taken away. The Gothic nobility still remained a distinct class, and held, along with the Catholic prelate, the right of choosing the king. Union with the Catholic church was accompanied by the introduction of the ecclesiastical ceremony of anointing, a change decidedly favorable to elective rule. The growth of those latter ideas which tended again to favor the hereditary doctrine had not time to grow up in Spain before the Mahometan conquest (711). The West-Gothic crown therefore remained elective till the end. The modern Spanish nation is the growth of the long struggle with the Mussulmans; but it has a direct connection with the West-Gothic kingdom. We see at once that the Goths hold altogether a different place in Spanish memory from that which they hold in Italian memory. In Italy the Goth was but a momentary invader and ruler; and the Teutonic element in Italy comes from other sources. In Spain the Goth supplies an important element in the modern nation. And that element has been neither forgotten nor despised. Part of the unconquered region of northern Spain, the land of Asturia, kept for a while the name of Gothia, as did the Gothic possessions in Gaul and in Crim. The name of the people who played so great a part in all southern Europe, and who actually ruled over so large a part of it, has now wholly passed away; but it is in Spain that its historical impress is to be looked for.

Gothic Language.—By this name, which may be taken generally as denoting the idioms of the various divisions of the Gothic nation, is more particularly meant the language exhibited in certain fragments of a translation of the Bible and other minor documents, which, although preserved in manuscript not dating farther back than perhaps the fifth century, and clearly written in Italy during the rule of the East-Goths, are commonly assumed to have originated among the West-Goths at the time when they were seated in Mœsia, and to be therefore older by at least a century than the manuscripts themselves. It is chiefly due to this assumption that the more distinctive name of *Mæsogothic*

language is often used, in England and elsewhere, as the simple *Gothic*. The latter name, however, seems to be more appropriate, in spite of the great probability of the assumption referred to,—since it is, for obvious reasons, utterly impossible to prove that the language of the West-Goths at that time differed from that of the East-Goths, or, even if there was any difference, to show that our manuscripts represent the original forms of the speech of their supposed West-Gothic author.

We have no direct evidence of the character of the Gothic language until the time of the above-mentioned manuscripts; but some conclusions regarding a more archaic state of the language may be drawn from a careful examination of the numerous words borrowed from Gothic at a much earlier period by some of the Finnish tribes originally dwelling in the interior of Russia. It may be safely assumed that some, at least, of these words still retain forms of the Gothic language from as early a period as perhaps the first or second century B.C. By the same date the Goths, as well as the other Teutonic nations, were no doubt already in possession of the Runic alphabet, an adaptation of a particular form of the Latin characters to their special wants and uses. No traces of this alphabet, however, have been left, except the already mentioned short inscription of the Bucharest ring, a list of the Gothic names of these runes, preserved in a Vienna manuscript of the ninth century, and some letters in Ulfila's Gothic alphabet, which soon supplanted the less convenient Runic characters, and so helped to inaugurate the short literary period of the Gothic language so closely connected with the name of that prelate.

Ulfila, or rather Vulfila (310-380 A.D., see ULFILA), was a man of the most profound learning. He not only invented, as has been said, a new alphabet for his literary purposes, but was also able to preach and to write in Latin and Greek as well as in his native Gothic language, and he is reported to have left behind him a great number of tracts and translations in these three idioms. The principal work of his life, however, was his translation of the Bible, parts of which seem to have reached us in the famous *Codex Argenteus*, now at Upsala, and in several minor fragments at Wolfer üttel (*Codex Carolinus*) and Milan (*Codices Ambrosiani*), including some leaves now kept at Rome and Turin). In this way we possess the greater part of the gospels, considerable portions of the epistles, and a few fragments of the Old Testament; there is also a fragment of a commentary on St. John's gospel, commonly called *Skeireins* (or "explanation"), and the fragment of a calendar which has been already mentioned as containing the original name of the Gothic people. The whole character of the translation too seems to indicate a man of Ulfila's mental power and theological learning. Although it cannot be denied that several alterations of the original have been introduced into our texts at a later time, it is certain both that the author carefully interpreted the Greek text (which was of course the fundamental source of his work), and also that he consulted, and in not a few places followed, the old Latin versions where his own ideas seemed to differ from those of his Greek authorities.

The Gothic language did not very long survive the times of Ulfila. From Mœsia, where it had gained its highest literary culture, it disappeared together with the Goths, when they were driven from these parts by later migrations. In the western portions of Europe, that is, in Italy, France and Spain, whither it had been carried by the emigrants, the Gothic language seems to have died out even sooner than the Gothic nationality, giving way to the overpowering influence of Latin, and leaving behind it only a few indistinct relics in some

proper names and other words that had been received into that victorious language.

It is well known that the literary remains of Gothic are (with the exception, perhaps, of a few Runic inscriptions belonging to the Scandinavian languages) by several centuries the oldest specimens of Teutonic speech, and therefore have a particular value for the student of the history of that family of languages. Notwithstanding this fact, it would be altogether wrong to regard Gothic as the common source of the more modern stages of these idioms. Although very archaic in many of its forms and sounds, it is in these still far removed from the original features of the common language, as that was spoken before any separation of Teutonic tribes had taken place. Most nearly related to it seem to have been the Scandinavian languages, which are now generally assumed to have formed, together with Gothic, the so-called eastern branch of the Teutonic family, while English, Frisian and Low and High German belonged to a western division.

GOTTFRIED. Meister Gottfried of Strasburg, the most brilliant German poet of the Middle Ages, flourished about the end of the twelfth and beginning of the thirteenth century. Of his life and position we have no certain information, for he has told us next to nothing about himself, and contemporary records are dubious and confusing. His chief work was written about 1210, and we may confidently place his death between 1210 and 1220.

GÖTTINGEN, the chief town of a circle of the same name in the land-drostei of Hildesheim and province of Hanover, Prussia, is pleasantly situated at the foot of the Hainberg, in the fertile valley of the Leine, about sixty-seven miles to the south of Hanover, on the Hanover and Cassel railway. It is traversed by the Leine, which separates the Altstadt from the Neustadt and Masch; and it is surrounded by ramparts which are planted with lime trees and form an agreeable promenade. The streets in the older part of the town are, for the most part, crooked and narrow, but the newer portions are spaciouly and regularly built. Apart from the churches and the numerous university buildings, it has few structures of any public importance. The university, the famous Georgia Augusta, founded by George II. in 1734, and opened in 1737, rapidly attained a leading position, and in the year 1823 its students numbered 1,547. Political disturbances, in which both professors and students were implicated, lowered the attendance to 860 in 1834; and the expulsion of the famous seven professors (Albrecht, Dahlmann, Ewald, Gervinus, Weber, and the brothers Grimm) in 1837, still further reduced its prosperity. The events of 1848, on the other hand, told somewhat in its favor; and since the annexation of Hanover in 1866 it has been carefully cherished by the Prussian government. Its recent professoriate includes, among other distinguished names, those of Benfey, Lagarde, Lotze, Ritchel, and Weber. Among those who have been teachers within its walls, may be mentioned, besides the seven already named, Haller, Gesner, Gatterer, Sprengel, Heyne, Blumenbach, Herbart, Heeren, O. Müller, K. F. Hermann, and Eichhorn. Neander, Ewald, and the distinguished chemist Bunsen, it may be added, were natives of Göttingen. The university library contains upward of 500,000 printed volumes and 5,000 manuscripts.

GOTTSCHALK, or **GOTESCHALCUS**, surnamed **FULGENTIUS**, a prominent figure in one of the most important theological controversies of the ninth century, was the son of Berno, a Saxon count. While returning from a pilgrimage to Rome in the year 847, Gottschalk, happening to pass a night at a hospice in Friuli,

came into contact with Notting, the newly elected bishop of Verona, and expounded to him his peculiar views. The bishop, apparently without saying much at the time, carried word to Hrabanus Maurus, who, meanwhile, had become archbishop of Mainz; the latter lost no time in issuing two letters, one to his informant and another to Count Eberhard of Friuli, in both which he denounced the opinions of Gottschalk with some recklessness and great violence. At a synod held in Mainz in presence of the emperor in 848, Gottschalk presented himself with a written explanation and defense of his views; he was, however, very summarily found guilty of heresy, and handed over to his ecclesiastical superior, Hincmar of Rheims, to be dealt with as his crime might deserve, and sentenced to be whipped severely and rigorously imprisoned. The place selected for his captivity was the monastery of Hautvilliers in the diocese of Rheims, and here he languished throughout the remainder of his life, a period of twenty years, notwithstanding the efforts of influential friends and his own pitiful appeals.

GOTTSCHED, **JOHANN CHRISTOPH**, a German author and critic of considerable influence in his own time, was born February 2, 1700, at Judithenkirch, near Königsberg, and died December 12, 1766. He was a pedant, but there is no doubt that he did good and lasting service to German literature.

GÖTZ, **JOHANN NIKOLAUS**, a minor German poet, born at Worms, July 9, 1721. He died at Winterberg November 4, 1781. The writings of Götz consist of a number of short lyrics and several translations, of which the best is a rendering of Anacreon.

GOUDA, or **TER GOUWE**, a town of the Netherlands, in the province of South Holland, at the confluence of the Gouw with the Yssel, twelve miles northeast of Rotterdam, at the junction of the railway from that city with the line between the Hague and Utrecht. Population (1901), 22,393.

GOUDIMEL, **CLAUDE**, composer of the sixteenth century, must be named among the founders of modern music. The French and the Belgians claim him as their countryman, but the place of his birth is not sufficiently established. In all probability, however, he was born at Vaison near Avignon, about the year 1510. In 1540 we find him established in Rome at the head of a musical school, and here, among many other celebrated musicians, Palestrina, the greatest master of the early Italian school, and one of the greatest masters of all schools, was among his pupils. About the middle of the century he seems to have left Rome for Paris, where, in conjunction with Jean Buchemin, he published, in 1555, a setting of Horace's *Odes*. Infinitely more important is another collection of vocal pieces, a setting of the celebrated French version of the Psalms by Marot and Beza, published in 1565. It is written in four parts, the melody being assigned to the tenor. Some of the tunes were probably of popular origin, and they are still used by the French Protestant Church. He was killed at Lyons, August 24, 1572.

GOUGH, **HUGH GOUGH**, **VISCOUNT**, British field-marshal, was of Irish origin, and was a descendant of Francis Gough, who was made bishop of Limerick in 1626. He was born at Woodstown, Limerick, November 3, 1779. After holding for a short time a commission in his father's regiment of militia, he was transferred to the line as ensign in August, 1794, and was soon after promoted lieutenant. In the following year he served with the 78th Highlanders at the Cape of Good Hope, taking part in the capture of Cape Town and of the Dutch fleet in Saldanha Bay. His next service was in the West Indies, where, with the 87th (Royal Irish Fusiliers), he shared in the attack on Porto Rico, the

capture of Surinam, and the brigand war in St. Lucia. In 1809 he was called to take part in the Peninsular War, and, joining the army under Wellington, commanded his regiment as major in the operations before Oporto, by which the town was taken from the French. At Talavera he was severely wounded, and had his horse shot under him. For his conduct on this occasion he was afterward promoted lieutenant-colonel, his commission, on the recommendation of Wellington, being antedated from the day of the duke's dispatch. Gough did not attain the rank of field-officer till 1830, when he was promoted major-general. Seven years later a new epoch opened for him; he was sent to India to take command of the Mysore division of the army. But not long after his arrival in India, the difficulties which had arisen between the Chinese and British Governments, and which led to the first Chinese war, made the presence of an energetic general on the scene indispensable, and Gough was appointed commander-in-chief of the British forces in China. After the conclusion of the treaty of Nanking in August, 1842, the British forces were withdrawn; and before the close of the year Gough was created a baronet, and was invested with the grand cross of the Bath. He also received the thanks of both houses of parliament. Returning to India, he was appointed (August, 1843,) commander-in-chief of the British forces in India. In December, 1843, he took the command in person against the Mahrattas, and defeated them at Maharajpore, capturing more than fifty guns. He defeated them again at Punniar, and peace was then concluded at Gwalior. In 1845 occurred the rupture with the Sikhs, who crossed the Sutlej in large numbers, and Sir Hugh Gough conducted the operations against them. In this campaign he was well supported by Lord Hardinge, the governor-general, who had been his comrade in the Peninsula, and now volunteered to serve under him. The Sikhs were defeated in three great battles in rapid succession—at Moodkee, Ferozeshah, and Soobraon—and submitted to make peace soon after at Lahore. The services of Sir Hugh Gough on these occasions were rewarded by a vote of thanks from both houses of parliament, and by his elevation to the peerage of the United Kingdom as Baron Gough (April, 1846). The war broke out again in 1848, and again Lord Gough took the field. With unabated energy he defeated the Sikhs at Ramnuggar, and at Chillianwallah, and finally broke their power by his decisive victory at Gujrat (February, 1849). He died near Dublin, March 2, 1869.

GOUGH, RICHARD, an English antiquary, the son of a wealthy East India director, was born in London, October 1, 1735. In 1752 he entered Benet College, Cambridge, where his taste for antiquarian research received additional impulse, and where he commenced his work on British topography, which was published in 1768. After leaving Cambridge in 1756, he began a series of antiquarian excursions in various parts of Great Britain, the fruit of which was seen in the volumes which he subsequently published. He became F.R.S. in 1775, and died in 1809.

GOUJET, CLAUDE PIERRE, a French abbé and litterateur, was born at Paris, October 19, 1697. As he received little remuneration for his writings, he came to be in circumstances of great poverty, and was compelled to sell his library, a sacrifice which hastened his death, which took place at Paris, February 1, 1767.

GOUJON, JEAN, was the most distinguished sculptor produced by France during the sixteenth century. Although some evidence has been offered in favor of the date 1520, the time and place of his birth are still uncertain. The first mention of his name occurs in the accounts of the church of St. Maclou, at Rouen, in the

year 1540, and in the following year he was employed at the cathedral of the same town, where he added to the tomb of Cardinal d'Amboise a statue of his nephew Georges, afterward removed. On leaving Rouen, Goujon was employed by Pierre Lescot, the celebrated architect of the Louvre, on the restorations of St. Germain l'Auxerrois. In 1547 appeared Martin's French translation of *Vitruvius*, the illustrations of which were due, the translator tells us in his *Dedication to the King*, to Goujon. We learn from this statement, not only that Goujon had been taken into the royal service on the accession of Henry II., but also that he had been previously employed under Bullant on the chateau of Écouen. At the Louvre, Goujon, under the direction of Lescot, executed the carvings of the southwest angle of the court, the reliefs of the *Escalier Henri II.*, and the *Tribune des Caryatides*. About a year before the execution of the *Caryatides*, for which Goujon received 737 livres on September 5, 1550, he produced, according to unbroken tradition, the reliefs of the Fontaine des Innocents. In 1555, his name appears again in the Louvre accounts, and continues to do so every succeeding year up to 1561, when all trace of him is lost. In the course of this year an attempt was made to turn out of the royal employment all those who were suspected of Huguenot tendencies. Goujon has always been claimed as a reformer; it is consequently possible that he was one of the victims of this attack. His death is said to have taken place during the St. Bartholomew massacre in 1572.

GOULD, AUGUSTUS ADDISON, American conchologist, was born at New Ipswich, N. H., April 23, 1805, graduated at Harvard College in 1825, and took his degree of doctor of medicine in 1830. Establishing himself in Boston, he devoted himself to the practice of medicine, and finally rose to high professional rank and social position. He became president of the Massachusetts Medical Society, and was employed as authority in editing the vital statistics of the State. As a conchologist his reputation is world-wide. He was a pioneer of the science in America. His writings fill many pages of the publications of the Boston Society of Natural History and other periodicals. The two most important monuments to his scientific work, however, are *The Mollusks and Shells of the United States* exploring expedition under Commodore Wilkes, published by the government, and the *Report on the Invertebrata*, published in 1841. The author's death took place at Boston, September 18, 1866.

GOURD, a name given to various plants belonging to the genus *Cucurbita*, monoecious trailing herbs of annual duration, with long succulent stems furnished with tendrils, and large, rough, palmately-lobed leaves; the flowers, reticulated with veins, are generally large and of a bright yellow or orange color, the barren ones with the stamens united; the fertile are followed by the large, succulent fruit that gives the gourds their chief economic value. Many varieties of *Cucurbita* are under cultivation in tropical and temperate climates, especially in southern Asia; but it is extremely difficult to refer them to definite specific groups, on account of the facility with which they hybridize; while it is very doubtful whether any of the original forms now exist in the wild state.

GOURGAUD, GASPARD, BARON, a French general of artillery, was born at Versailles, September 14, 1783. After studying at the polytechnic school and at the artillery school of Châlons, he joined the artillery in 1802, acquitted himself with distinction in several campaigns and received in 1807 the cross of honor and the grade of captain. He served in the subsequent Spanish and Austrian campaigns, and in 1811 he was sent to report on the strength of the fortifications of

Dantzic, a mission that he fulfilled so much to the satisfaction of Napoleon that he was named one of the emperor's ordnance officers. During the Russian campaign he was the first to enter the Kremlin at Moscow, where he removed the match from a large quantity of powder the explosion of which would in all probability have destroyed the emperor's life. For this service he received the title of baron. He accompanied the emperor in his subsequent campaigns, and in 1814, at the battle of Brienne, was again successful in delivering him from imminent peril. After the accession of Louis XVIII. he was named chief of the staff of the first artillery division, but on the return of Napoleon from Elba he was nevertheless named by him adjutant and general, and took part in the battle of Waterloo. Being one of the three French officers chosen by Napoleon to accompany him to St. Helena, he was employed there in collecting materials for a history of Napoleon's campaigns, but on account of some misunderstanding with Montholon, he left the island, and went to England. He published in 1818 *La Campagne de 1815*, and he also endeavored to interest the emperors of Russia and Austria in Napoleon's behalf. Shortly afterward he was expelled from England as a spy of Napoleon's. Returning to France in 1821, he published, along with Montholon, in 1823, *Mémoires de Napoléon à Sainte-Hélène*. In 1827, he became involved in a controversy with Sir Walter Scott regarding some statements made by the latter in his life of Napoleon. After the July revolution of 1830, Gourgaud was appointed to the command of the artillery of Paris and Vincennes; in 1832 he was named aid-de-camp of the king, and in 1835 lieutenant-general. In 1840 he was one of the commissioners sent to bring the remains of Napoleon to France. On the occurrence of the revolution of February, 1848, his name was struck off the list of generals, but after the events of the following June he was chosen colonel of the first legion of the national guard of Paris. In 1849 he was elected representative of the legislative assembly for the department of Deux-Sèvres. He died July 25, 1852.

GOUT, a specific constitutional disorder connected with excess of uric acid in the blood, and manifesting itself by inflammation of joints, with deposition therein of urate of soda, and also by morbid changes in various important organs. The term gout, which was first used about the end of the thirteenth century, is derived through the French *goutte* from the Latin *gutta*, a drop, in allusion to the old pathological doctrine of the dropping of a morbid material from the blood within the joints. The disease was known and described by the ancient Greek physicians under various terms, which, however, appear to have been applied by them alike to rheumatism and gout.

Hippocrates in his *Aphorisms* speaks of gout as occurring most commonly in spring and autumn, and mentions the fact that women are less liable to it than men. He also gives directions as to treatment. Celsus gives a similar account of the disease. Galen regarded gout as an unnatural accumulation of humors in a part, and the chalkstones as the concretions of these, and he attributed the disease to over-indulgence and luxury. Gout is alluded to in the works of Ovid and Pliny, and Seneca in his ninety-fifth epistle mentions the prevalence of gout among the Roman ladies of his day as one of the results of their high-living and debauchery.

It is often stated that the attack of gout comes on without any previous warning; but, while this is true in many instances, the reverse is probably as frequently the case, and the premonitory symptoms, especially in those who have previously suffered from the disease, may

be sufficiently precise to indicate the impending seizure. Among the more common of these may be mentioned marked disorders of the digestive organs, with a feeble and capricious appetite, flatulence and pain after eating, and uneasiness in the right side in the region of the liver. When the affected part is examined it is found to be swollen and of a deep red hue. The superjacent skin is tense and glistening, and the surrounding veins are more or less distended. After a few hours there is a remission of the pain, slight perspiration takes place, and the patient may fall asleep. The pain may continue moderate during the day but returns as night advances, and the patient goes through a similar experience of suffering to that of the previous night, followed with a like abatement toward morning. These nocturnal exacerbations occur with greater or less severity during the continuance of the attack, which generally lasts for a week or ten days. As the symptoms decline the swelling and tenderness of the affected joint abate, but the skin over it pits on pressure for a time, and with this there is often associated slight desquamation of the cuticle. During the attacks there is much constitutional disturbance. The patient is restless and extremely irritable, and suffers from cramp in the limbs and from dyspepsia, thirst, and constipation. The urine is scanty and high-colored, with a copious deposit, consisting chiefly of urates. During the continuance of the symptoms the inflammation may leave the one foot and affect the other, or both may suffer at the same time. After the attack is over the patient feels quite well and fancies himself better than he had been for a long time before; hence the once popular notion that a fit of the gout was capable of removing all other ailments. Any such idea, however, is sadly belied in the experience of most sufferers from this disease.

Attacks of gout are readily excited in those predisposed to the disease. Exposure to cold, disorders of digestion, fatigue, and irritation or injuries of particular joints will often precipitate the gouty paroxysm.

With respect to the treatment of gout the greatest variety of opinion has prevailed and practice been pursued. The general plan of treatment can be here only briefly indicated. During the acute attack the affected part should be kept at perfect rest, and have applied to it warm opiate fomentations or poultices, or, what answers fully better, be enveloped in cotton-wool covered in with oil silk. The diet of the patient should be light, without animal food or stimulants. The administration of some simple laxative will be of service, as well as the free use of alkaline diuretics, such as the bicarbonate or acetate of potash. The medicinal agent most to be relied on in the treatment of gout is colchicum, which manifestly exercises a powerful action on the disease. This drug (*Colchicum autumnale*), which is believed to correspond to the hermodactyl of the ancients, was introduced as a remedy for gout about a century ago, and has proved of such efficacy in modifying the attacks that, as observed by Doctor Garrod, "we may safely assert that colchicum possesses as specific a control over the gouty inflammation as cinchona barks or their alkaloids over intermittent fever." The mode of action of colchicum in gout is by no means determined, since it would appear to have no certain effect upon the uric acid excreted from the system; and the general opinion seems to be that this drug has a special sedative effect on the gouty inflammation. It is usually administered in the form of the wine in doses of 5-15 drops every four or six hours, or in pill as the acetous extract (gr. $\frac{1}{4}$ -gr. $\frac{1}{2}$). Of late years, colchicum, in combination with iodide of potassium, has been much used in chronic gout, and as an eliminative of uric acid no agent surpasses lemon juice. Lithia, and the various mineral

waters holding that substance in solution, are recommended by eminent authorities.

The treatment and regimen to be employed in the intervals of the gouty attacks are of the highest importance. These bear reference, for the most part, to the habits and mode of life of the patient. Restriction must be laid upon the amount and quality of the food, and equally, or still more, upon the alcoholic stimulants. By those most advanced in life, who, from long-continued habit, are unable entirely to relinquish the use of stimulants, the strictest possible temperance must be observed. Regular, but moderate exercise, in the form of walking or riding, in the case of those who lead sedentary lives, is of great advantage; and all over-work, either physical or mental, should be avoided. The effect upon the gouty constitution of certain mineral waters and baths is well known. The particular place must, in each case, be determined by the physician; and special caution must be observed in recommending this plan of treatment in persons whose gout is complicated by organic diseases of any kind.

GOUVION SAINT CYR, LAURENT, MARQUIS DE, a French marshal, was born at Toul, April 13, 1764. At the age of eighteen he went to Rome with the view of prosecuting the study of painting, but, although he continued his artistic studies after his return to Paris in 1784, he never definitely adopted the profession of a painter. In 1792 he was chosen a captain in the *chasseurs républicains*, and served on the staff of General Custine. His promotion rapidly followed, and in the course of two years he had become a general of division. In 1796 he commanded the center division of Moreau's army in the campaign of the Rhine, and by coolness and sagacity greatly aided him in his brilliant defense against superior numbers, and in his subsequent celebrated retreat. In 1798 he was appointed to the command of the army of Italy, the officers of which had revolted against their general Massena, and he was speedily successful in obtaining the complete reestablishment of discipline. In the following year he commanded the left wing of Jourdan's army in Germany; but when Jourdan was succeeded by Massena, he joined the army of Moreau, in Italy, where, in face of great difficulties, he was not only completely successful in his defensive tactics, but gained, on December 13th, an important victory at Albano. When Moreau, in 1800, was appointed to the command of the army of the Rhine, Gouvion St. Cyr was named his first lieutenant, and on May 9th gained a victory over General Kray at Biberach. In 1801 he was sent to Spain to command the army intended for the invasion of Portugal, and was named grand officer of the legion of honor. When a treaty of peace was shortly afterward concluded with Portugal, he succeeded Lucien Bonaparte as ambassador at Madrid. In 1803 he was appointed to the command of an army corps in Italy, and he gained in 1805 a victory over the Austrians at Castel Franco. He took part in the Prussian and Polish campaigns of 1807, and in 1808 he commanded an army corps with some success in Catalonia; but, not wishing to comply with certain orders he received from Paris, he resigned his command and remained in disgrace till 1811. On the opening of the Russian campaign he received command of the sixth army corps, and on August 7, 1812, obtained a victory over the Russians at Polosk, in recognition of which he was created a marshal of France. He distinguished himself at the battle of Dresden, August 26 and 27, 1813, but, after a stubborn resistance, capitulated there to the allies on November 11th following, and remained for some time a prisoner in Hungary. On the restoration of the Bourbons he was created a peer in France, and in July, 1815, was appointed war minister, but resigned

his office in the November following. In June, 1817, he was appointed minister of marine, and in September following again resumed the duties of war minister, which he continued to discharge till November, 1819. He died March 17, 1830.

GOVERNMENT. Without attempting to discriminate by verbal definitions the various shades of meaning which this word assumes, we shall use it in this article in its widest sense—that of the ruling power in a political society. The conception of society which this use of the word implies may be illustrated by two well-known theories.

In John Austin's celebrated analysis of law, the first step is the proposition that a law is a command issued by a superior to a subject and enforced by a sanction or penalty. The laws of God, with reference to the conduct of men, the laws of a private club or association of men with reference to the conduct of its members, and the laws of a political society, are all, according to Austin's definition, laws properly so called. The laws of nature are laws not properly so called. They are generalizations as to the uniform course of nature, and have no analogy to laws properly so called except in point of uniformity. Positive law, again, is distinguished from other laws, properly so called, as the command of the sovereign of an independent political community. A sovereign is a person, or a determinate body of persons, to whom the bulk of the community is habitually obedient. Every word in this definition has its precise meaning, which is developed by Austin with admirable clearness. The faculty "of untying knots" on which he prided himself is nowhere more conspicuously manifested than in the analysis which lays bare the real meaning of the common phrases used to describe the fundamental parts of society. It is not our purpose to examine the value of this analysis here, but simply to call attention to the assumption that in every society of men there is a determinate body (whether consisting of one individual, or a few or many individuals) whose commands the rest of the community obey. This sovereign body is what in more popular phrase is termed the Government of the country, and the varieties which may exist in its constitution are known as forms of government.

Mr. Herbert Spencer, approaching the study of society under the influence of conceptions derived from the study of physical organisms, brings us to very much the same result. The union of men in society is itself an organic structure, having parts and functions corresponding to the parts and functions of an animal or a plant. Mr. Spencer pursues this analogy so fully and minutely as to leave the impression that he believes it to be something more than an analogy,—that it is a general law from which true deductions regarding society may be drawn. The veins and arteries correspond to our railroads and highways; the nerves, communicating intelligence to the brain, are paralleled by the telegraph wires; the centralized action of society at the seat of government is the same thing as the regulative activity of the brain. Government is here represented by the regulative functions of a living organism, and forms of government are so many varieties in the structure. Austin, for the purposes of jurisprudence, finds it convenient to regard society as molded by the will of a dominant body. Spencer exhibits the regulative parts of society as bound up with the rest in one organism. With both the existence of a government is necessary to the conception of society. In the one theory the element of command, in the other that of regulation, is conspicuous. If to these we add a third, that of simple agency, we shall have a tolerably complete view of the relations between Government

and society. Besides commanding the conduct of individuals, besides regulating the relations of the various members of society, Government may be conceived of as merely the instrument of society. Where men are united in groups there arises from their union the necessity of action on behalf of the group. That part of society which attends to the business of the whole is the Government.

Two main lines of inquiry divide the subject. The first relates to varieties in the structure of the governing body—forms of government. The second relates to the functions of the governing body, the sphere of government, the things which fall within the province of state action. In both lines we have to deal with the ascertained facts of the past history and present condition of human societies. In both we have also to notice the speculative opinions of political thinkers. Notwithstanding the apparent confusion it will probably be found more convenient not to separate the historical from the speculative treatment of the subject. What is the best form of government?—is not quite the same question as what was the constitution of Athens or Rome? What are the proper limits of state interference?—is not the same question as what are the functions of the state in France or England? And yet the same answer may often serve for both sets of questions. Ideal constitutions have a suspicious resemblance to the constitutions with which their authors are most familiar. The political speculations of Plato and of Cicero are based on the state systems of Greece and Italy. Cicero's ideal code in the treatise *De Legibus* is simply an adaption of the Twelve Tables. On the other hand, the form of political speculation is often determined by, and in turn determines the practical politics of the time. The intimate connection between speculation and practice in politics is strikingly illustrated in the period of controversy which culminated in the Revolution of 1688. The irreconcilable claims of crown and parliament threw the mind back on first principles. Never had theorists a better chance. Popular government and absolute government each sought to establish itself on a basis of reason and nature.

Origin of Government.—A preliminary question, formerly of vast theoretical importance would be, What is the origin of government? How did government come into existence? As a question of historical fact, it demands for its solution a knowledge of the whole past of the human race. It has been answered over and over again in times when historical knowledge could hardly be said to exist, and it has, therefore, been answered without any reference to history. The answers which have satisfied the minds of men may be distinguished broadly into three classes. The first class would comprehend the legendary accounts which nations have given in primitive times of their own forms of government. These are always attributed to the mind of a single lawgiver. The government of Sparta was the invention of Lycurgus. Solon, Moses, Numa and Alfred in like manner shaped the government of their respective nations. The second may be called the logical or metaphysical account of the origin of government. It contained no overt reference to any particular form of government, whatever its covert references may have been. It answered the question, How government in general came into existence; and it answered it by a logical analysis of the elements of society. The phenomenon to be accounted for being government and laws, it abstracted government and laws, and contemplated mankind as existing without them. The characteristic feature of this kind of speculation is that it reflects how contemporary men would behave if all government were removed, and infers that men must have behaved so be-

fore government came into existence. Society without government resolves itself into a number of individuals, each following his own aims, and, therefore, in the days before government, each man followed his own aims. It is easy to see how this kind of reasoning should lead to very different views of the nature of the supposed original state.

The "social compact" is the most famous of the metaphysical explanations of government. It has had the largest history, the widest influence, and the most complete development. To the same class belong the various forms of the theory that governments exist by divine appointment. Of all that has been written about the divine right of kings, a great deal must be set down to the mere flatteries of courtiers and ecclesiastics. But there remains a genuine belief that men are bound to obey their rulers because their rulers have been appointed by God. Like the social compact, the theory of divine appointment avoided the question of historical fact.

The application of the historical method to the phenomena of society has changed the aspect of the question and robbed it of its political interest. The student of the history of society has no formula to express the law by which government is born. All that he can do is to trace governmental forms through various stages of social development. The more complex and the larger the society, the more distinct is the separation between the governing part and the rest, and the more elaborate is the subdivision of functions in the government. The primitive type of ruler is king, judge, priest, and general. At the same time, his way of life differs little from that of his followers and subjects. The metaphysical theories were so far right in imputing greater equality of social conditions to more primitive times. Increase of bulk brings with it a more complex social organization. War tends to develop the strength of the governmental organization; peace relaxes it. All societies of men exhibit the germs of government; but there would appear to be races of men so low that they cannot be said to live together in society at all. Recent investigations have illustrated very fully the importance of the family in primitive societies, and the belief in a common descent has much to do with the social cohesion of a tribe. The government of a tribe resembles the government of a household; the head of the family is the ruler. But we cannot affirm that political government has its origin in family government, or that there may not have been states of society in which government of some sort existed while the family did not.

Political writers from the time of Aristotle have been singularly unanimous in their classification of the forms of government. There are three ways in which states may be governed. They may be governed by one man, or by a number of men, small in proportion to the whole number of men in the state, or by a number large in proportion to the whole number of men in the state. The government may be a monarchy, an aristocracy, or a democracy.

Aristotle divides governments according to two principles. In all states the governing power seeks either its own advantage or the advantage of the whole state, and the government is bad or good accordingly. In all states the governing power is one man, or a few men, or many men. Hence six varieties of government, three of which are bad and three good. Each excellent form has a corresponding depraved form, thus:

The good government of one (Monarchy) corresponds to the depraved form (Tyranny).

The good government of few (Aristocracy) corresponds to the depraved form (Oligarchy).

The good government of many (Commonwealth) corresponds to the depraved form (Democracy).

The fault of the depraved forms is that the governors act unjustly where their own interests are concerned. The worst of the depraved forms is tyranny, the next oligarchy, and the least bad democracy. Each of the three leading types exhibits a number of varieties. Thus in monarchy we have the heroic, the barbaric, the elective dictatorship, the Lacedæmonian, and absolute monarchy. So democracy and oligarchy exhibit four corresponding varieties. The best type of democracy is that of a community mainly agricultural, whose citizens, therefore, have not leisure for political affairs, and allow the law to rule. The best oligarchy is that in which a considerable number of small proprietors have the power; here, too, the laws prevail. The worst democracy consists of a larger citizen class having leisure for politics; and the worst oligarchy is that of a small number of very rich and influential men. In both the sphere of law is reduced to a minimum. A good government is one in which as much as possible is left to the laws, and as little as possible to the will of the governor.

The *Politics* of Aristotle, from which these principles are taken, presents a striking picture of the variety and activity of political life in the free communities of Greece. The king and council of heroic times had disappeared, and self-government in some form or other was the general rule. It is to be noticed, however, that the governments of Greece were essentially unstable. The political philosophers could lay down the law of development by which one form of government gives birth to another. Aristotle devotes a large portion of his work to the consideration of the causes of revolutions. The dread of tyranny was kept alive by the facility with which an over-powerful and unscrupulous citizen could seize the whole machinery of government. Communities oscillated between some form of oligarchy and some form of democracy. The security of each was constantly imperiled by the conspiracies of the opposing factions. Hence, although political life exhibits that exuberant variety of form and expression which characterizes all the intellectual products of Greece, it lacks the quality of persistent progress. Then there was no approximation to a national government, even of the federal type. The varying confederacies and hegemonies are the nearest approach to anything of the kind.

In Rome each citizen had a right to vote laws in his own person in the comitia of the centuries or the tribes. The administrative powers of government were, however, in the hands of a bureaucratic assembly, recruited from the holders of high public office. The senate represented capacity and experience rather than rank and wealth. Without some such instrument the city government of Rome could never have made the conquest of the world. The gradual extension of the citizenship to other Italians changed the character of Roman government. The distant citizens could not come to the voting booths; the device of representation was not discovered; and the comitia fell into the power of the town voters. In the last stage of the Roman republic, the inhabitants of one town wielded the resources of a world-wide empire. We can imagine what would be the effect of leaving to the people of London or Paris the supreme control of the British empire or of France—irresistible temptation, inevitable corruption. The rabble of the capital learn to live on the rest of the empire.

The Roman empire bequeathed to modern Europe the theory of universal dominion. The nationalities which grew up after its fall arranged themselves on the

basis of territorial sovereignty. Leaving out of account the free municipalities of the Middle Ages, the problem of government had now to be solved, not for small urban communities, but for large territorial nations. The mediæval form of government was feudal. One common type pervaded all the relations of life. The relation of king and lord was like the relation between lord and vassal. The bond between them was the tenure of land.

The connection between representation and the feudal system of estates must be shortly noticed. The feudal theory gave the king a limited right to military service and to certain aids, both of which were utterly inadequate to meet the expenses of the government, especially in time of war. The king therefore had to get contributions from his people, and he consulted them in their respective orders.

The English System.—The right of the commons to share the power of the king and lords in legislation, the exclusive right of the commons to impose taxes, the disappearance of the clergy as a separate order, were all important steps in the movement toward popular government. The extinction of the old feudal nobility in the dynastic wars of the fifteenth century simplified the question by leaving the crown face to face with parliament. The immediate result was, no doubt, an increase in the power of the crown, which probably never stood higher than it did in the reigns of Henry VIII. and Elizabeth, but even these powerful monarchs were studious in their regard for parliamentary conventionalities. After a long period of speculative controversy and civil war, the settlement of 1688 established limited monarchy as the government of England. Since that time the external form of government has remained unchanged, and, so far as legal description goes, the constitution of William III. might be taken for the same system as that which still exists. The silent changes have, however, been enormous. The most striking of these, and that which has produced the most salient features of the English system, is the growth of cabinet government. Intimately connected with this is the rise of the two great historical parties of English politics. The normal state of government in England is that the cabinet of the day shall represent that which is, for the time, the stronger of the two. Before the Revolution the king's ministers had begun to act as a united body, but, even after the Revolution, the union was still feeble and fluctuating, and each individual minister was bound to the others only by the tie of common service to the king. Under the Hanoverian sovereigns the ministry became consolidated, the position of the cabinet became definite, and its dependence on parliament, and more particularly on the House of Commons, was established. Ministers were chosen exclusively from one house or the other, and they assumed complete responsibility for every act done in the name of the crown. The simplicity of English politics has divided parliament into two nearly equal parties, and the party in opposition has been steadied by the consciousness that it, too, has constitutional functions of high importance. Criticism is sobered by being made responsible. Along with this movement went the withdrawal of the personal action of the monarch in politics. No king has attempted to veto a bill since the Scotch Military Bill was vetoed by Queen Anne. No ministry has been dismissed by the sovereign since 1834. Whatever the power of the monarch may be, it is unquestionably limited to his personal influence over his ministers. And it must be remembered that ministers are responsible ultimately, not to parliament, but to the House of Commons.

Apart, therefore, from the democratic changes of

1832 and 1867, we find that the House of Commons, as a body, had gradually made itself the center of the government. Since the area of the constitution has been enlarged, it may be doubted whether the orthodox descriptions of the government any longer apply.

The parliamentary government developed by England out of feudal materials has been deliberately accepted as the type of constitutional government all over the world. Nearly all the European States and nearly all the European colonies, dependent or independent, have adopted, more or less fully, the leading features of the English system—that is to say, popular representation more or less extensive, a bicameral legislature, and a cabinet or consolidated ministry. In connection with all of these, numberless questions of the highest practical importance have arisen, the bare enumeration of which would surpass the limits of our space.

The Two Chambers.—First, as to the double chamber. This, which is perhaps more accidental than any other portion of the English system, has been the most widely imitated. In most European countries, in the English colonies, in the United States congress, and in the separate States of the Union, there are two houses of legislature. This result has been brought about partly by natural imitation of the accepted type of free government, partly from a conviction that the second chamber will moderate the democratic tendencies of the first. The theoretical question would take too long to argue, but it is easy to show that the elements of the English original cannot be reproduced to order under different conditions. There have, indeed, been a few attempts to imitate the special character of hereditary nobility attaching to the English House of Lords, and these few have failed. The complete solidarity existing between the English nobility and at least the politically privileged, if not the whole mass, of their countrymen, is a result not to be attempted by the framers of constitutions. The English system, too, after its own way, obviates any danger of collision between the Houses,—the standing and obvious danger of the bicameral system. In England there is no doubt where the real sovereignty lies. The actual ministers of the day must possess the confidence of the House of Commons; they need not—in fact, they often do not—possess the confidence of the House of Lords. It is only in legislation that the Lower House really shares its power with the Upper; and the constitution possesses, in the unlimited power of nominating peers, a well-understood last resource should the House of Lords persist in refusing important measures demanded by the representatives of the people. In all but measures of first-class importance, however, the House of Lords is a real second chamber, and in these there is little danger of a collision between the Houses. There is the widest possible difference between the English and any other second chamber. In the United States the Senate (constituted on the system of equal representation of States, the members of which are elected by State legislatures—each State, irrespective of size or population, being entitled to two senators) is the more important of the two Houses, and the only one whose control of the executive can be compared to that exercised by the British House of Commons. In the English colonies a dead-lock between the two Houses is a matter of frequent occurrence. In France it is anticipated if not an intended source of danger to the new republican constitution.

The real strength of popular government in England lies in the ultimate supremacy of the House of Commons. That supremacy had been acquired, perhaps to its full extent, before the extension of the suffrage made the constituencies democratic. Foreign imitators,

it may be observed, have been more ready to accept a wide basis of representation than to confer real power on the representative body. In all the monarchic countries of Europe, however unrestricted the right of suffrage may be, the real victory of constitutional government has yet to be won. Where the suffrage means little or nothing, there is little or no reason for guarding it against abuse. The independence of the executive in the United States brings that country, from one point of view, more near to the Continental than to the English state system. The people make a more complete surrender of power to the government than is done in England.

Cabinet Government.—The peculiar functions of the English cabinet are not easily matched in any foreign system. They are a mystery even to most educated Englishmen. The cabinet in England is much more than a body consisting of chiefs of departments. It is the inner council of the empire, the arbiter of national policy, foreign or domestic, the sovereign in commission. The whole power of the House of Commons is concentrated in its hands. At the same time, it has no place whatever in the legal constitution. Its numbers and its constitution are not fixed even by any rule of practice. It keeps no record of its proceedings. The relations of an individual minister to the cabinet, and of the cabinet to its head and creator, the premier, are things known only to the initiated. With the doubtful exception of France, no other system of government presents us with anything like its equivalent. In the United States, as in the European monarchies, we have a council of ministers surrounding the chief of the state.

One of the most difficult problems of government is how to provide for the devolution of political power, and perhaps no other question is so generally and justly applied as the test of a working constitution. If the transmission works smoothly, the constitution, whatever may be its other defects, may at least be pronounced stable. It would be tedious to enumerate all the contrivances which this problem has suggested to political societies. Here, as usual, Oriental despotism stands at the bottom of the scale. When sovereign power is imputed to one family, and the law of succession fails to designate exclusively the individual entitled to succeed, assassination becomes almost a necessary measure of precaution. The prince whom chance or intrigue has promoted to the throne of a father or an uncle, must make himself safe from his relatives and competitors.

Change of Power in the United States.—The United States offers a very different solution of the problem. The American president is at once king and prime minister; and there is no titular superior to act as a conduit-pipe between him and his successor. His crown is rigidly fixed; unshakable for four years (except in rare cases by the extreme measure of impeachment), after four years he ceases to reign. No hostile vote can affect his power as the head of the administration, and it is difficult to resist his will even in legislation. But the day of his demise is known from the first day of his government; and almost before he begins to reign the political forces of the country are shaping out a new struggle for the succession. Further, a change of government in America means a change of the entire administrative staff. The commotion caused by a presidential election in the United States is thus infinitely greater than that caused by a general election in England. A change of power in England affects comparatively few personal interests, and absorbs the attention of the country for a comparatively short space of time. In the United States it is long foreseen and elaborately prepared for,

and when it comes it involves the personal fortunes of large numbers of citizens. And yet the English constitution is more democratic than the American, in the sense that the popular will can more speedily be brought to bear upon the government.

State Government.—In the various States of the American Union the chief executive, or governor, occupies about the same position with regard to the legislature that the president does to congress. He is elected, as are in most cases several of the higher State officials, by the popular vote. He possesses, in nearly all cases, the pardoning power, and has a veto, which can be overcome by a two-thirds majority in both Houses. He is commander-in-chief of the State army and navy, and, upon the call of a sheriff, can order the State troops to suppress riot or insurrection. With him also rests the responsibility of calling on the federal executive for assistance in case of invasion; and without his permission no federal troops can be sent within the bounds of the State, except to garrison fort, arsenals, etc., belonging to the general government. He has also the appointment of United States senators and judges to fill vacancies, pending the action of the legislature, and he appoints members of State boards, and nominates notaries public. In most instances his nominations require confirmation by the Senate. Their terms of office vary in the different States.

Change of Power in France.—The established practice of England and America may be compared with the nascent constitutionalism of France. Here the problem presents different conditions. The head of the state is neither a premier of the English, nor a president of the American type. He is served by a prime minister and a cabinet, who, like an English ministry, hold office on the condition of parliamentary confidence; but he holds office himself on the same terms, and is, in fact, a minister like the others. So far as the transmission of power from cabinet to cabinet is concerned, he discharges the functions of an English king. But the transmission of power between himself and his successor is protected by no constitutional devices whatever, and recent experience would seem to show that no such devices are really necessary. As to the practice in France, this much seems clear: Some rearrangement of the relations of the president and the cabinet must soon take place. It seems difficult to distinguish between a parliamentary president and a parliamentary ministry, or to see why they should not stand or fall together. Possibly the existence of numerous political parties, and the open disloyalty to the existing constitution professed by some of them, may retard the simplification of the French governmental system. Other European countries professing constitutional government appear to follow the English practice. The Swiss republic is so peculiarly situated that it is hardly fair to compare it with any other. But it is interesting to note that, while the rulers of the states are elected annually, the same persons are generally reelected.

Representation.—The questions connected with representation are too numerous to be discussed with advantage here. Two recent changes of great importance may be noticed in the English system—the vote by ballot, and the partial introduction of what is called the minority vote. By the latter, in a constituency returning three members, each elector has only two votes, and a minority exceeding one-third can thus elect at least one of the three.

Recapitulation.—What is the appropriate sphere of government? What kind of business does it undertake, and what kind of business ought it to undertake? By what limits is its action to be restricted? Here too the field is occupied by disputed theories and diversified

practice. And the sphere assigned to state action in different ages and countries varies as widely as the form of government.

The action of the state, or sovereign power, or government in a civilized community shapes itself into the three-fold functions of legislation, judicature, and administration. The two first are perfectly well defined, and the last includes all the kinds of state action not included in the other two. It is with reference to legislation and administration that the line of permissible state-action requires to be drawn. There is no doubt about the province of the judicature, and that function of government may therefore be dismissed with a very few observations.

The complete separation of the three functions marks a high point of social organization. In simple societies the same officers discharge all the duties which we divide between the legislator, the administrator, and the judge. The arts themselves are not consciously recognized as being of different kinds. The evolution of all the parts of a highly complex government from one original is illustrated in a striking way by the history of English institutions. All the conspicuous parts of the modern government, however little they may resemble each other now, can be followed back without a break to their common origin. Parliament, the cabinet, the privy council, the courts of law, all carry us back to the same *nidus* in the council of the feudal king.

The business of judicature, requiring as it does the possession of a high degree of technical skill and knowledge, is generally intrusted by the sovereign body or people to a separate and independent class of functionaries. In England, the appellate jurisdiction of the House of Lords still maintains in theory the connection between the supreme legislative and the supreme judicial functions. It is only recently that the important subject of divorce passed from the legislative chambers to the courts of law, a condition of things yet existing in some of the United States. In some of the States of the American Union the judicial functions of the upper house are still maintained after the example of the English constitution as it existed when these States were founded. In England there is also still a considerable amount of judicial work in which the people takes its share. The inferior magistracies, except in populous places, are in the hands of private persons. And by the jury system the ascertainment of fact has been committed in very large measure to persons selected indiscriminately from the mass of the people, subject to a small property qualification. But the higher functions of the judicature are exercised by persons whom the law has jealously fenced off from external interference and control. The independence of the bench distinguishes the English system from every other. It was established in principle as a barrier against monarchical power, and hence has become one of the traditional ensigns of popular government. In many of the American States the spirit of democracy has demanded the subjection of the judiciary to popular control. The judges are elected directly by the people, and hold office for a short term, instead of being appointed, as in England, by the responsible executive, and removable only by a vote of the two Houses. In other States the judges of the courts, above the grade of local magistrates, are elected either by the legislature, or, if police judges, by the municipal councils. There is not the smallest sign that democratic opinion in England is tending in this direction. At the same time the constitution of the United States has assigned to the supreme court of the Union a perfectly unique position, standing in singular contrast to the depraved condition of many of the State judiciaries. The supreme court is the guardian of the constitution.

It has to judge whether a measure passed by the legislative powers is or is not void by reason of being unconstitutional, and it may therefore have to veto the deliberate resolutions of both Houses of Congress and the president. It is admitted that this singular experiment in government has been completely justified by its success.

The question of the limits of state action does not arise with reference to the judiciary. The enforcement of the laws is a duty which the sovereign power must of absolute necessity take upon itself. But to what conduct of the citizens the laws shall extend is the most perplexing of all political questions. The correlative question with regard to the executive would be what works of public convenience should the state undertake through its own servants. The whole question of the sphere of government may be stated in these two questions: What should the state do for its citizens? and how far should the state interfere with the action of its citizens? These questions are the direct outcome of modern popular government; they are equally unknown to the small democracies of ancient times and to despotic governments at all times. Accordingly ancient political philosophy, rich as it is in all kinds of suggestions, has very little to say that has any bearing on the sphere of government. The conception that the power of the state can be and ought to be limited belongs to the times of "government by discussion," to use Mr. Bagehot's expression, to the time when the sovereign number is divided by class interests, and when the action of the majority has to be carried out in the face of strong minorities, capable of making themselves heard. Aristotle does indeed dwell on one aspect of the question. He would limit the action of the government in the sense of leaving as little as possible to the personal will of the governors, whether one or many. His maxim is that the law should reign. But that the sphere of law itself should be restricted, otherwise than by general principles of morality, is a consideration wholly foreign to ancient philosophy. The state is conceived as acting like a just man, and justice in the state is the same thing as justice in the individual. The Greek institutions which the philosophers are unanimous in commending, are precisely those which the most state-ridden nations of modern times would agree in repudiating.

A more profitable line of inquiry has been followed by writers of the economical school. The most important of these is John Stuart Mill, whose essay on *Liberty*, together with the concluding chapters of his treatise on *Political Economy*, gives a tolerably complete view of the principles of government. The leaning of political economists is toward what is called the *laissez-faire* or non-interference doctrine. There is a general presumption against the interference of Government, which is only to be overcome by very strong evidence of necessity. Governmental action is generally less effective than voluntary action. The necessary duties of Government are so burdensome, that to increase them destroys its efficiency. Its powers are already so great that individual freedom is constantly in danger. As a general rule, nothing which can be done by the voluntary agency of individuals should be left to the state. Each man is the best judge of his own interests. But, on the other hand, when the thing itself is admitted to be useful or necessary, and it cannot be effected by voluntary agency, or when it is of such a nature that the consumer cannot be considered capable of judging of the quality supplied, then Mr. Mill would allow the state to interpose. Thus the education of children, and even of adults, would fairly come within the province of the state. Mr. Mill even goes so far as to admit that, where a restriction of the hours of labor, or the establishment of a periodical holiday, is proved to be beneficial to laborers as a class,

but cannot be carried out voluntarily on account of the refusal of individuals to coöperate, Government may justifiably compel them to coöperate. Still further, Mr. Mill would desire to see some control exercised by the Government over the operations of those voluntary associations which, consisting of large numbers of shareholders, necessarily leave their affairs in the hands of one or a few persons. In short, Mr. Mill's general rule against state action admits of many important exceptions, founded on no principle less vague than that of public expediency. The essay on *Liberty* is mainly concerned with freedom of individual character, and its arguments apply to control exercised, not only by the state, but by society in the form of public opinion. The leading principle is that of Humboldt, "the absolute and essential importance of human development in its richest diversity." Humboldt broadly excluded education, religion, and morals from the action, direct and indirect, of the state. Mill, as we have seen, conceives education to be within the province of the state, but he would confine its action to compelling parents to educate their children.

The most thoroughgoing opponent of state action, however, is Mr. Herbert Spencer. In his *Social Statics*, published in 1850, he holds it to be the essential duty of government to *protect*—to maintain men's rights to life, to personal liberty, and to property; and the theory that the Government ought to undertake other offices besides that of protector he regards as an untenable theory. Each man has a right to the fullest exercise of all his faculties, compatible with the same right in others. This is the fundamental law of equal freedom, which it is the duty and the only duty of the state to enforce. If the state goes beyond this duty, it becomes, not a protector, but an aggressor. Thus all state regulations of commerce, all religious establishments, all Government relief of the poor, all state systems of education and of sanitary superintendence, even the state currency and the post-office, stand condemned, not only as ineffective for their respective purposes, but as involving violations of man's natural liberty. Many of the principles enunciated in this book are not reconcilable with the later views of the author, but he would still appear to maintain his theory of government to the fullest extent. Thus, in the *Principles of Sociology*, published in 1877, he distinguishes between the militant type of society and the industrial type. The former is framed on the principle of compulsory coöperation, while the latter is framed on the principle of voluntary coöperation. He vaguely indicates "a possible future social type, differing as much from the industrial as this does from the militant—a type which, having a sustaining system more fully developed than any one known at present, will use the products of industry neither for maintaining a militant organization nor exclusively for material aggrandizement, but will devote them to the carrying on of higher activities." Of the two actually existing types, the militant is distinguished by a strong and the industrial by a feeble governmental system. Reversing the analogy suggested by individual organisms, he holds the latter to be a higher and better type than the former. And he maintains that military activity in a state distinguished by a high degree of industrial development produces a recurrence to the militant type of institutions generally. Thus, in Germany, the dealings of Bismarck with the ecclesiastical powers, and the measures taken for centralizing the state control of railways, are instances of a more coercive régime established by war. In England, the peaceful period from 1815 to 1850 is contrasted with the militant period since 1850. The latter has been marked by the usurpations of military officialism, by sanitary dictation, by coercive philan-

thropy, by compulsory education, by an unhesitating faith in state judgment, and by a general disregard of the principles of free government, even on the side of the party which in the previous period effected changes in the direction of freedom.

Freedom of contract, in general, has been greatly advanced by the success of the free-trade agitation in 1843, which was not so much a protest against State regulation as a demand for a cheap supply of food. Since that time, the principle that the State should leave men to make what bargains they please, without attempting to encourage any particular industry or to favor any special class, has taken rank as a maxim of universal application.

Education of Children.—This is perhaps the most conspicuous, as it is certainly the most beneficial and the least disputed, of the recent encroachments of the State. The progress of opinion and legislation on this subject has been singular and rapid. Beginning with Government grants in aid of education, strenuously resisted on grounds going to the very root of the question of legitimate state interference, the system has now culminated in a net-work of state-supported and state-administered schools spread over the whole country. That the state should compel parents to educate their children would only be a slight departure, if any, from the general principle imposing duties on parents and disabilities on children. Under the present system the state not only compels the parent to educate, but itself provides, and in great measure pays for, the education. A generation of discussion has, however, drawn very distinctly the line beyond which this advance of state authority must not proceed. Compulsory state education is for children only, and may be justified by the general argument which justifies state protection to the helpless; it is elementary only; and it is secular only.

GOWER, JOHN, one of the best of the English minor poets, was born in or about the year 1325. It has been conclusively shown by Sir Harris Nicolas that he belonged to the county of Kent. His family was wealthy; and he seems to have had various country houses. So far as we know he did not marry till 1397, when he was united to Agnes Groundolf. He was an intimate friend of Chaucer; but there is no evidence to prove that they were fellow-students. A few years after his marriage, Gower became blind, and had to give up writing. He spent his declining years in the priory of St. Mary Overies, or, as it is now called, St. Saviour's, in Southwark, where his monument is still to be seen.

Gower's poetical works are four in number—*Balades and Other Poems*, in French, printed in 1818 for the Roxburghe Club; the *Speculum Meditantis*, a treatise on the duties of married life, written in French verse, and divided into ten books; *Vox Clamantis*, a narrative in Latin elegiacs, of the insurrection of the commons in the reign of Richard II.; and the *Confessio Amantis*. The second of these works is believed to have perished; of the third there is a good edition by the Rev. H. O. Coxe, printed for the Roxburghe Club in 1850; and the fourth was first printed by Caxton in 1483. Gower died in 1408.

GOYA, a town of the Argentine Republic, in the province of Corrientes, near the junction of a small stream with the Paraná, about one hundred miles south of Corrientes. Population about 14,000.

GOYANNA, a city of Brazil, in the province of Pernambuco, on a river of its own name, about ten miles from the sea. Population about 14,000.

GOYA V LUCIENTES, FRANCISCO, Spanish painter, was born in 1746 at Fuendetodos, a small Aragonese village near Saragossa. At an early age he commenced his artistic career under the direction of José

Luzan Martinez, who had studied painting at Naples under Mastroleo. Finding it convenient to retire for a time from Madrid, he decided to visit Rome at his own cost; and being without resources he joined a "quadriga" of bull-fighters, passing from town to town until he reached the shores of the Mediterranean. In 1772 he was awarded the second prize in a competition initiated by the academy of Parma, styling himself "pupil to Bayen, painter to the king of Spain." Compelled to quit Rome somewhat suddenly, he appears again in Madrid in 1775, the husband of Bayeu's daughter, and father of a son. On returning to Madrid he commenced painting canvases for the tapestry factory of Santa Barbara, in which the king took much interest. Between 1776 and 1780 he appears to have supplied thirty examples, receiving about £1,200 for them.

In portraiture, without doubt, Goya excelled; his portraits are evidently life-like and unexaggerated, and he disdained flattery. He worked rapidly, and during his long stay at Madrid painted, among many others, the portraits of four sovereigns of Spain—Charles III. and IV.; Ferdinand VII. and "King Joseph." The duke of Wellington also sat to him; but on his making some remark which raised the artist's choler, Goya seized a plaster cast and hurled it at the head of the duke. There are extant two pencil sketches of Wellington, one in the British Museum, the other in a private collection. One of his best portraits is that of the lovely Andalusian duchess of Alva. Goya retired from Madrid, desiring probably during his latter years to escape the trying climate of that capital. He died at Bordeaux in his eighty-third year, and a monument has been erected there over his remains. From the deaths of Velasquez and Murillo to the advent of Fortuny, Goya's name is the only important one found in the history of Spanish art.

GOYAZ, or, as it was formerly called, Villa Boa de Goyaz, the chief town of the province of Goyaz in Brazil, in the valley of the auriferous Velmelho, a right-hand tributary of the Araguaia. Population (1900) of the province, about 230,000.

GOYEN, JAN JOSEPHSZOON VAN, was born at Leyden on January 13, 1596, learned painting under several masters at Leyden and Haarlem, married in 1618, and settled at the Hague about 1631. One of the few Dutch painters who failed to captivate English taste, his influence was great on Dutch art; and he was one of the first to emancipate himself from the traditions of minute imitation embodied in the works of Breughel and Savery. He died at the Hague in 1656, possessed of land and houses to the amount of 15,000 florins.

GOZLAN, LÉON, a French novelist and play writer, was born at Marseilles in 1803, and died in 1866. When he was still a boy, his father, who had made a large fortune as a ship-broker, met with adverse circumstances, and Léon, before completing his education, had to go to sea in order to earn a living. He went several trading voyages to Algiers and to Senegal, without, it would seem, much profit. In the meantime his literary tastes gradually developed, and he abandoned mercantile pursuits for the employment of a teacher in Marseilles. He, however, did not remain long there, and in 1828 we find him in Paris, determined to run the risks of literary life. His townsman, Joseph Méry, who was then making himself famous by his political satires, smoothed his way, and introduced him to several newspapers. But Gozlan did not sacrifice literature to politics. Though he contributed many essays to the reviews, it is as a fertile and ingenious author of novels and plays that he is best known.

GOZO. See MALTA.

GOZZI, CARLO, COUNT, an Italian dramatist, was descended from an old Venetian family, and was born in March, 1722. At the age of sixteen he joined the army in Dalmatia; but three years afterward returned to Venice, where he soon made a reputation for himself as the wittiest member of the Granelleschi society, to which the publication of several satirical pieces had gained him admission. This society, nominally devoted to conviviality and wit, had also serious literary aims, and was especially zealous to preserve the Tuscan literature pure and untainted by foreign influences. The displacement of the old Italian comedy by the dramas of Chiari and Goldoni, founded on French models, threatened defeat to all their efforts; and in 1757 Gozzi came to the rescue by publishing a satirical poem, and in 1761 by a comedy, a parody of the manner of the two obnoxious poets, founded on a fairy tale. For its representation he obtained the services of the Sacchi company of players, who, on account of the popularity of the comedies of Chiari and Goldoni—which afforded no scope for the display of their peculiar talents—had been left without employment; and as their satirical powers were thus sharpened by personal enmity, the play met with extraordinary success. Struck by the effect produced on the audience by the introduction of the supernatural or mythical element, which he had merely used as a convenient medium for his satirical purposes, Gozzi now produced a series of dramatic pieces based on fairytales, which, for a period, obtained great popularity, but after the breaking up of the Sacchi company were completely disregarded. They have, however, obtained high praise from Goethe, Schlegel, Madame de Staël, and Sismondi; and one of them, *Re Turandote*, was translated by Schiller. In his later years Gozzi set himself to the production of tragedies, in which the comic element was largely introduced; but as this innovation proved unacceptable to the critics, he had recourse to the Spanish drama, from which he obtained models for various pieces which, however, met with only equivocal success. He died April 4, 1806.

GOZZI, GASPARO, COUNT, eldest brother of Carlo Gozzi, was born December 4, 1713. In 1739 he married the poetess, Louise Bergalli, and she undertook the management of the theater of San Angelo, Venice, he supplying the performers with dramas chiefly translated from the French. The speculation proved unfortunate, but meantime he had attained a high reputation for his contributions to the *Gazetta Veneta*, and he soon came to be known as one of the ablest critics and purest and most elegant stylists in Italy. For a considerable period he was censor of the press in Venice, and in 1774 he was appointed to reorganize the university system at Padua. He died at Padua, December 26, 1786.

GOZZOLI, BENOZZO, an eminent painter, was born in Florence in 1424, or perhaps 1420, and in the early part of his career assisted Fra Angelico, whom he followed to Rome, and worked with at Orvieto. While in Rome, he executed, in the *Capella* at Araceli, a fresco of *St. Anthony and Two Angels*. In 1449 he left Angelico, and went to Montefalco, near Foligno in Umbria. In S. Fortunato, near Montefalco, he painted a *Madonna and Child with Saints and Angels*, and three other works. One of these, the altar-piece representing St. Thomas receiving the Girdle of the Virgin, is now in the Lateran Museum, and shows the affinity of Gozzoli's early style to Angelico's. He next painted in the monastery of St. Francis, Montefalco, filling the choir with a triple course of subjects from the life of the saint, with various accessories, including heads of Dante, Petrarch, and Giotto. This work was completed in 1452, and is still marked by the style of Angelico, crossed here and there with a more distinctly

Giottesque influence. In the same church, in the chapel of St. Jerome, is a fresco by Gozzoli of the *Virgin and Saints, the Crucifixion*, and other subjects. He remained at Montefalco probably till 1456, employing Mesastris as assistant. Thence he went to Perugia, and painted in a church a *Virgin and Saints*, now in the local academy, and soon afterward to his native Florence, the headquarters of art. By the end of 1459 he had nearly finished his important labor in the chapel of the Palazzo Riccardi, *The Journey of the Magi to Bethlehem*, and, in the tribune of this chapel, a composition of *Angels in Paradise*. His picture in the London National Gallery, a *Virgin and Child with Saints*, 1461, belongs also to the period of his Florentine sojourn. Another small picture in the same gallery, *the Rape of Helen*, is of dubious authenticity. In 1464 Gozzoli left Florence for S. Gimignano, where he executed some extensive works; in the church of St. Augustine, a composition of St. Sebastian protecting the city from the plague of this same year, 1464; over the entire choir of the church, a triple course of scenes from the legends of St. Augustine, from the time of his entering the school of Tegaste on to his burial, seventeen chief subjects, with some accessories; in the Pieve di S. Gimignano, the *Martyrdom of Sebastian*, and other subjects, and some further works in the city and its vicinity. Here his style combined something of Lippo Lippi with its original elements, and he received coöperation from Giusto d'Andrea. He staid in this city till 1467, and then began, in the Campo Santo of Pisa, from 1469, the vast series of mural paintings with which his name is specially identified. These are twenty-four subjects from the Old Testament, with the *Invention of Wine by Noah* to the *Visit of the Queen of Sheba to Solomon*. He contracted to paint three subjects per year, for about ten ducats each—a sum which may be regarded as equivalent to about £100 at the present day. It appears, however, that this contract was not strictly adhered to, for the rate of painting was only three pictures in two years. Perhaps the great multitude of figures and accessories was accepted as a set-off against the slower rate of production. By January, 1470, he had executed the fresco of *Noah and his Family*,—followed by the *Curse of Ham*, the *Building of the Tower of Babel* (which contains portraits of Cosmo de' Medici, the young Lorenzo, Poliziano, and others), the *Destruction of Sodom*, the *Victory of Abraham*, the *Marriages of Rebecca and of Rachel*, the *Life of Moses*, etc. In the Cappella Ammannati, facing a gate of the Campo Santo, he painted also an *Adoration of the Magi*, wherein appears a portrait of himself. He died about 1496.

GRAAL. See GRAIL.

GRABE, JOHANN ERNST, a learned divine of the Anglican Church, was born July 10, 1666, at Königsberg, where his father, the author of some treatises now forgotten, was professor of theology and history. In the course of his theological studies Grabe succeeded in persuading himself of the schismatical character of the Reformation of the sixteenth century, and accordingly presented to the consistory at Samland a memorial in which he compared the position of the evangelical Protestant churches with that of the Simonians, Novatians, and other ancient schismatics. He died on November 3, 1711, and in 1726 a monument was erected to him by Lord Oxford in Westminster Abbey.

GRABOW, a town of Pomerania, Prussia, government district of Stettin and circle of Randow, is situated on the Oder below Stettin, and closely adjoining its suburbs. Population in 1900, about 15,000.

GRACCHUS is the name of a family of the *Gen*

Sempronius. To this family there attaches a remarkably sweet and lovable nature, which, combined with their high character and ability, makes their history the most charming page in the Roman annals. Tiberius Sempronius Gracchus was appointed magister equitum after the battle of Cannæ, and held the consulship in 215 and 213 B.C. During the great weakness that followed the defeat at Cannæ the resolute and judicious generalship by which he ably seconded Fabius did much to maintain a courageous attitude at Rome. He raised some legions of slaves; and his generous conduct kept them together and made them important in the war. After several successes he was betrayed by a Lucanian fr to the hands of Mago, and having fallen in the battle that ensued, he was honored with a magnificent burial by Hannibal. Another Tiberius, born about 210, married Cornelia, the daughter of Scipio Africanus, who is famous as the highest type of Roman matron. As praetor and propraetor, Gracchus governed Hither Spain from 181 to 178. He conquered the Celtiberi, and by his magnanimous and kindly treatment of the Spaniards made a lasting impression on them. He was consul in 177 and 163. In 169, as censor, his review of the senate and equites was very strict; but, though his colleague became unpopular, Gracchus remained as much esteemed as ever. He enjoyed a high reputation for his power of calming down internal seditions and conciliating foreign enemies of the state. One of his daughters became the wife of Scipio Africanus the younger; while his two sons, Tiberius and Gaius, famous besides for having determined the history of Rome at a critical point, are as remarkable for the charm of their personal character and for the careful education given them by their widowed mother. Tiberius served as quaestor in Spain in 137; and the respect still entertained by the Spaniards for his father's name enabled him to save the Roman army from utter ruin after its defeat by the Numantinis. (See ROMAN HISTORY.)

GRACES is the name generally given to the Greek goddesses Charites. The chief seat of their worship was the ancient Boeotian city Orchomenus. They were three in number, but their names were not known; and stones fallen from heaven stood in their temple as symbols of the goddesses. Their worship was instituted by a king Eteocles, whose three daughters fell into a well while dancing in honor of the Charites.

GRACKLE, a word which has been much used in ornithology, but generally in a vague sense, though restricted to members of the families *Sturnidae* belonging to the Old World, and *Icteridae* belonging to the New. Of the former those to which it has been most commonly applied are the species variously known as Mynas, Mainas, and Minors of India and the adjacent countries, and especially the *Gracula religiosa* of Linnaeus, who, according to Jerdon and others, was very probably led to confer this epithet upon it by confounding it with the *Sturnus* or *Acridotheres tristis*, which is regarded by the Hindus as sacred to Ram Deo, one of their deities, while the true *Gracula religiosa* does not seem to be anywhere held in veneration.

GRACIAN, BALTAZAR, one of the principal "cultistas" or Spanish prose writers of the school of Gongora, was born at Calatayud, Aragon, in 1584. Little is known of his personal history except that on attaining to manhood he entered the Society of Jesus, and that ultimately he became rector of the Jesuit College at Tarazona, where died in 1658. His principal works are *El Héroe* (1630), written in short compact sentences, which has been described as a sort of recipe for making a hero; *La Agudza, y Arte de Ingenio* (1648), a sort of art of poetry or system of rhetoric in which the principles

of "Gongorism" are inculcated; *Crítico* (1650-53), an allegory in which, under the imagery of the seasons of the year, the course of human life is described; *El Discreto*, a delineation of the typical character of a courtier; *Oráculo Manual*, a system of rules for the conduct of life.

GRADISCA, a town of Austria, in the principality of Görz and Gradisca, situated about ten miles southwest of Görz, on the right bank of the Isonzo. Population (1900), about 4,000.

GRADUATION is the name given to the art of dividing straight scales, circular arcs, or whole circumferences into any required number of equal parts. It is the most important and difficult part of the work of the mathematical instrument maker, and is required in the construction of most physical, astronomical, nautical and surveying instruments, such as thermometer scales, linear measuring instruments, quadrants, sextants, mural circles, theodolites, etc.

The art was, undoubtedly, first practiced by clock-makers for cutting the teeth of their wheels at regular intervals; but so long as it was confined to them, no particular delicacy or accurate nicety in its performance was required. This only arose when astronomy began to be seriously studied, and the exact position of the heavenly bodies to be determined, which created the necessity for strictly accurate means of measuring linear and angular magnitude. Then graduation began to be looked upon as an art which required special talents and training, and hence we find that all the best artists have spent their best efforts on the perfecting of astronomical instruments. Of these may be named Abraham Sharp, Bird, Smeaton, Ramsden, the Duc de Chaulnes, John and Edward Troughton, Simms and Ross.

It is obvious that the first graduated instrument must have been done by the hand and eye alone, whether it was in the form of a straight-edge with equal divisions, or a screw, or a divided plate; but, once in the possession of one such divided instrument, it was a comparatively easy matter to employ it as a standard, and copy its divisions on any other article that might be desired. Hence graduation naturally divides itself into two distinct branches, *original graduation* and *copying*, which latter may be done either by the hand or by a machine called a dividing engine. It is proper thus to speak of graduation under the three heads of *original graduation*, *copying* and *machine graduation*.

GRÆCIA, MAGNA, was the name given to the Greek cities along the coast of South Italy, while the people were called Italiotes. Like most Greek colonies, they were established first as trading stations, which grew into independent cities. At a very early time a trade in copper was carried on between Greece and the Ttiræan Gulf. The trade for long lay chiefly in the hands of the Eubœans; and Cyme in Campania was founded far back in the pre-historic time, when the Eubœan Cyme was still a great city. To strengthen the connection with the far off Cyme, the Chalcidians, who became early the leaders of Eubœan enterprise, established Rhegium, (about 730 B.C.) After this the energy of Chalcis went onward to Sicily, and the states of the Corinthian Gulf carried out the colonization of Italy. Sybaris (720) and Crotona (710) were Achæan settlements; Locri Epizephyrii (about 710) was settled by Ozolian Locrians, and when (about 708) the Spartans wished to get rid of a band of unruly citizens, the connection formed by the trade in purple that was common to the shores of Laconia and Tarentum directed their colony thither. Ionian Greeks fleeing from foreign invasion founded Siris and, much later, Elea (540).

GRÆVIUS. Johann Georg Gräfe, Greffe, or

Grævius, one of the great classical scholars of the seventeenth century, was born at Naumburg, Saxony, January 29, 1632, and after receiving the usual school education at the gymnasium of Pforta became a student of law in the university of Leipsic. During a casual visit to Deventer in his eighteenth year, he became acquainted with Gronovius; and this circumstance greatly stimulated a taste for pure scholarship which he had already begun to display somewhat to the detriment of his professional prospects. Finally abandoning jurisprudence shortly afterward, he studied philology for two years under Gronovius, and subsequently sat under Heinsius at Leyden, and under Morus and Blondel at Amsterdam. During his residence in the last-named city he abandoned Lutheranism and joined the Reformed Church; and in 1656 he was called by the elector of Brandenburg to the chair of belles lettres in the university of Duisburg. Two years afterward he was, on the recommendation of Gronovius, chosen to succeed that scholar at Deventer; and in 1662 he was translated to the university of Utrecht, where he occupied first the chair of rhetoric, and afterward from 1667 until his death (January 11, 1703) that of history and politics.

GRÄFE, ALBRECHT VON, German oculist, son of Karl Ferdinand von Gräfe, noticed below, was born at Berlin in May, 1828. At an early age he manifested a preference for the study of mathematics, but this was gradually superseded by an interest in natural science, which led him ultimately to the study of medicine. After obtaining government license at Berlin, he prosecuted his studies at Vienna, Prague, and Paris, devoting special attention to ophthalmology. In 1850 he began practice as an oculist in Berlin, where he founded a private institution for the treatment of the eyes, which became the model of many similar ones in Germany and Switzerland. In 1853 he was appointed teacher of ophthalmology in Berlin university, in 1856 extraordinary professor, and in 1866 ordinary professor. He died at Berlin, August 20, 1870.

GRÄFE, HEINRICH, educationist, was born at Buttstädt in Weimar, May 3, 1802, studied mathematics and theology at Jena, and in 1823 obtained a curacy in the stadtkirche of Weimar. Thence he was transferred to Jena as rector of the town school in 1825; in 1840 he was also appointed extraordinary professor of the science of education (Pädagogik) in that university; and in 1842 he became head of the bürgerschule in Cassel. After reorganizing the schools of the town, he became director of the new realschule in 1843; and, devoting himself with great zeal and energy to the interests of educational reform in electoral Hesse, he became in 1849 a member of the school commission, and also entered the house of representatives, where he attached himself to the democratic party and made himself somewhat formidable as an agitator. In 1852 for having been implicated in the September riots and in the movement against the unpopular minister Hassenpflug (who had dissolved the school commission) he was condemned to three years' imprisonment, a sentence which was afterward reduced to one of twelve months. On his release he withdrew to Geneva, where he engaged in educational work till 1855, when he was appointed director of the school of industry at Bremen. He died in that city July 21, 1868.

GRÄFE, CARL FERDINAND VON, German surgeon, was born at Warsaw, March 8, 1787. He studied medicine at Halle and Leipsic, and after obtaining license from the latter university, he was in 1807 appointed private physician to Duke Alexius of Anhalt-Bernburg. In 1811 he became professor of surgery at Berlin, and during the war with Napoleon he was superintendent of the military hospitals. When peace

was concluded in 1815, he resumed his professorial duties. He was also appointed to the medical staff of the army, and he became a director of the Frederick-William Institute, and of the Medico-Chirurgical Academy. He died suddenly, July 4, 1840, at Hanover, whither he had been called to operate on the eyes of the crown prince.

GRAFTON, a town in Taylor county, W. Va., 280 miles west of Baltimore, and 99 miles southeast of Wheeling. It is a station on the Baltimore & Ohio railroad, and possesses banking and telegraph facilities, flour-mills, a foundry, and the railroad machine shops. Population (1900), 5,650.

GRÄFRATA, a town of Rhenish Prussia, government district of Düsseldorf, circle of Solingen, situated on the small river Itter, fourteen miles east of Düsseldorf. Population about 7,000.

GRAGANO, a town of Italy, in the province of Naples and circle of Castellamare, about two and a half miles east of Castellamare. Pop. (1900), about 14,278.

GRAHAM, SIR JAMES GEORGE ROBERT, Bart., a well-known British statesman, was born at Naworth, Cumberland, June 1, 1792. From Westminster school he duly passed to Queen's College, Cambridge; and shortly after quitting the university, while making the "grand tour" abroad, he became private secretary to the British minister in Sicily, in which capacity he not only acquired much useful experience but also rendered some important services. Shortly after his return to England he, in 1818, after a contest of extraordinary keenness, was returned to parliament as member for Hull in the Whig interest; but he was unseated at the election of 1820. In 1824 he succeeded to the baronetcy on his father's death; and in 1826 he again entered parliament as representative for Carlisle. In the same year he published a pamphlet entitled *Corn and Currency*, which brought him into considerable prominence in the political world as a man of advanced Liberal opinions; and having been returned in 1830 for the county of Cumberland, he became one of the most most energetic advocates in parliament of the Reform Bill. On the formation of Earl Grey's administration he received the post of first lord of the admiralty, with a seat in the cabinet. From 1832 to 1837 he sat for the eastern division of the county of Cumberland; but dissensions on the Irish Church question led to his withdrawal from the ministry in 1834, and ultimately to his joining the Conservative party. Rejected by his former constituents in 1837, he was in 1838 elected for Pembroke, and in 1841 for Dorchester. In the latter year he took office under Sir Robert Peel as secretary of state for the home department, and this post he retained until 1846. As home secretary he incurred considerable odium, in Scotland at least, by his unconciliating policy on the church question prior to the "disruption" of 1843; and in 1844 the detention and opening of letters at the postoffice by his warrant raised a storm of public indignation, which was hardly allayed by the favorable report of a parliamentary committee of investigation. From 1846 to 1852 he was out of office; but in the latter year he joined Lord Aberdeen's cabinet as first lord of the admiralty, in which capacity he acted also for a short time in the Palmerston ministry of 1855, until the appointment of a select committee of inquiry into the conduct of the Russian war put him upon his defense, and ultimately led to his withdrawal from official life. He continued, however, as a private member to exercise a considerable influence on parliamentary opinion until his death, which occurred at Netherby, Cumberland, October 26, 1861.

GRAHAM, THOMAS, born at Glasgow on December 21, 1804, was the son of a merchant of that city. In

1819 he entered the university of Glasgow, and graduated in 1824. At this time the chair of chemistry was held by Dr. Thomas Thomson, whose researches bearing on the atomic theory cannot fail to have had much influence in turning Graham's thoughts to the study of molecular physics to which he so patiently devoted his life. The beginning of his career appears to have been much embittered by his father's opposition, who wished him to become a minister of the Established Church. His own views, however, prevailed, and he worked for two years in the laboratory of Doctor Hope of Edinburgh before returning to Glasgow, where he taught mathematics, and subsequently chemistry, until the year 1829, when he was appointed lecturer in the Mechanics' Institute. In 1830 he succeeded Doctor Ure as professor of chemistry in the Andersonian Institution, and, on the death of Dr. Edward Turner, he was transferred to the chair of chemistry in University College, London. He presided over the chemical section of the British Association at the Birmingham meeting in 1839, and in 1841 was chosen as the first president of the Chemical Society of London. He resigned his professorship on being appointed to succeed Sir John Herschel as Master of the Mint, a post he held until his death in September, 1869. The researches, which he conducted between 1861 and 1869 were as brilliant as any of those in which he engaged. Graham was elected a fellow of the Royal Society in 1837, a corresponding member of the Institute of France in 1847, and doctor of civil law in 1855. The presidency of the Royal Society was offered him toward the close of his life, but his failing health caused him to shrink from accepting the honor.

GRAHAM, JAMES, was born at Glasgow, April 22, 1765. His principal work is *The Sabbath*—a sacred and descriptive poem in blank verse, characterized by a fine vein of tender and devotional feeling, and by the happy delineation of Scottish scenery. He is the Cowper of Scotland, but wants Cowper's mastery of versification and easy idiomatic vigor of style.

GRAHAM'S TOWN, the metropolis of the eastern districts of the Cape Colony, South Africa, is situated in the division of Albany, eighty miles inland from Algoa Bay, forty miles inland from Port Alfred, and six hundred miles from Cape Town. The population of Graham's Town, according to the last census, is 12,000. It is the center of trade for an extensive pastoral and agricultural country, and has easy communication both with Port Alfred, at the mouth of the Kowie river, and with Port Elizabeth on Algoa Bay.

GRAIL, or GRAYLE, THE HOLY, the name given to the legendary wonder-working vessel said to have been brought by Joseph of Arimathea to Britain.

GRAINS OF PARADISE, GUINEA GRAINS, or MELEGUETA PEPPER, are the seeds of *Amonum Melegueta*, Roscoe, a reed-like plant of the natural order *Zingiberaceae*, which is a native of tropical western Africa, and of Princes and St. Thomas' Islands in the Gulf of Guinea, is cultivated in British Guiana, and may with ease be grown in hot-houses in England. The plant has a branched horizontal rhizome; smooth, nearly sessile, alternate leaves, with the blade oblong-lanceolate; large, white, pale pink, or purplish flowers; and an ovate-oblong fruit, ensheathed in bracts, which is of a scarlet color when fresh, and reaches under cultivation a length of five inches. The seeds are contained in the acid pulp of the fruit, are commonly wedge-shaped and bluntly angular, are about one and one-quarter line in diameter, and have a glossy dark brown husk, with a conical light-colored membranous caruncle at the base, and a white kernel.

GRAM, or CHICK-PEA, called also Egyptian Pea, or

Bengal Gram, an herbaceous, annual, leguminous plant, the *Cicer arictinum* of Linnaeus, so named from the resemblance of its seed to a ram's head, is a native of the south of Europe and India. Its leaves are imparipinnate, with ovate, equal, and serrate leaflets; the flowers are axillary, and of a bluish-purple color, and bloom in India from September to October; and the pods have a length of one to one and a half inches, and contain either one or two somewhat pointed and commonly pale yellow seeds, about three lines long.

GRAMMAR. By the grammar of a language is meant either the relations borne by the words of a sentence and by sentences themselves, one to another, or the systematized exposition of these. The exposition may be, and frequently is, incorrect; but it always presupposes the existence of certain customary uses of words when in combination. In what follows, therefore, grammar will be generally employed in its primary sense, as denoting the mode in which words are connected together in order to express a complete thought, or as it is termed in logic, a proposition.

The object of language is to convey thought, and, so long as this object is attained, the machinery for attaining it is of comparatively slight importance. The way in which we combine our words and sentences matters but little, provided that our meaning is clear to others. The expressions "horseflesh" and "flesh of a horse," are equally intelligible to an Englishman, and therefore are equally recognized by English grammar. The Chinese manner of denoting a genitive is by placing the defining word before that which it defines, as in *koué jin*, "man of the kingdom," literally "kingdom man;" and the only reason why it would be incorrect in French or Italian is that such a combination would be unintelligible to a Frenchman or an Italian. Hence it is evident that the grammatical correctness or incorrectness of an expression depends upon its intelligibility—that is to say, upon the ordinary use and custom of a particular language. Whatever is so unfamiliar as not to be generally understood is also ungrammatical. In other words, it is contrary to the habit of a language, as determined by common usage and consent.

In this way we can explain how it happens that the grammar of a cultivated dialect and that of a local dialect in the same country so frequently disagree. Thus, in the dialect of West Somerset, *thee* is the nominative of the second personal pronoun, while in cultivated English the plural accusative *you* has come to represent a nominative singular. Both are grammatically correct within the sphere of their respective dialects, but, no further. *You* would be as ungrammatical in West Somerset as *thee* is in classical English; and both *you* and *thee*, as nominative singular, would have been equally ungrammatical in Early English. Grammatical propriety is nothing more than the established usage of a particular body of speakers at a particular time in their history.

It follows from this that the grammar of a people changes, like its pronunciation, from age to age. Anglo-Saxon or Early English grammar is not the grammar of Modern English, any more than Latin grammar is the grammar of modern Italian; and to defend an unusual construction or inflexion on the ground that it once existed in literary Anglo-Saxon, is as wrong as to import a peculiarity of some local dialect into the grammar of the cultivated speech. It further follows that different languages will have different grammars, and that the differences will be more or less according to the nearer or remoter relationship of the languages themselves, and the modes of thought of those who speak them. Consequently, to force the grammatical framework of one language upon another is to miscon-

ceive the whole nature of the latter, and seriously to mislead the learner. Chinese grammar, for instance, can never be understood until we discard, not only the terminology of European grammar, but the very conceptions which underlie it, while the polysynthetic idioms of America defy all attempts to discover in them "the parts of speech" and the various grammatical ideas which occupy so large a place in our school-grammars. The endeavor to find the distinctions of Latin grammar in that of English has only resulted in grotesque errors, and a total misapprehension of the usage of the English language.

It is to the Latin grammarians—or, more correctly, to the Greek grammarians, upon whose labors those of the Latin writers were based—that we owe the classification of the subjects with which grammar is commonly supposed to deal. The grammar of Dionysius Thrax, which he wrote for Roman schoolboys in the time of Pompey, has formed the starting-point for the innumerable school-grammars which have since seen the light, and suggested that division of the matter treated of which they have followed. He defines grammar as a practical acquaintance with the language of literary men, and as divided into six parts—accentuation and phonology, explanation of figurative expressions, definition, etymology, general rules of flexion, and critical canons. Of these, phonology and accentuation, or prosody, can properly be included in grammar only in so far as the construction of a sentence and the grammatical meaning of a word are determined by accent or letter-change; the accentual difference in English, for example, between *in'sense* and *incense* belongs to the province of grammar, since it indicates a difference between noun and verb; and the changes of vowel in the Semitic languages, by which various nominal and verbal forms are distinguished from one another, constitute a very important part of their grammatical machinery. But where accent and pronunciation do not serve to express the relation of words in a sentence, they fall into the domain of phonology, not of grammar. The explanation of figurative expressions, again, must be left to the rhetorician, and definition to the lexicographer; the grammarian has no more to do with them than he has with the canons of criticism.

In fact, the old subdivision of grammar, inherited from the grammarians of Rome and Alexandria, must be given up, and a new one put in its place. What grammar really deals with are all those contrivances whereby the relations of words and sentences are pointed out. Sometimes it is position, sometimes phonetic symbolization, sometimes composition, sometimes flexion, sometimes the use of auxiliaries, which enables the speaker to combine his words together so that they shall be intelligible to another. Grammar may accordingly be divided into the three departments of composition or "word-building," syntax, and accidence, by which is meant an exposition of the means adopted by language for expressing the relations of grammar when recourse is not had to composition or simple position.

A good practical grammar of a language should be based on a correct appreciation of the facts which it expounds, and a correct appreciation of the facts is only possible where they are examined and coördinated in accordance with the scientific method. A practical grammar ought, wherever it is possible, to be preceded by a scientific grammar.

The historical grammar of a single language or dialect, which traces the grammatical forms and usages of the language as far back as documentary evidence allows, affords material to the comparative grammarian, whose task it is to compare the grammatical forms and usages of an allied group of tongues, and thereby reduce them to their earliest forms and senses. The work thus car-

ried out by the comparative grammarian within a particular family of languages is made use of by universal grammar, the object of which is to determine the ideas that underlie all grammar whatsoever, as distinct from those that are peculiar to special families of speech. Universal grammar is sometimes known as "the metaphysics of language," and it has to decide such questions as the nature of gender, or of the verb, the true purport of the genitive relation, or the origin of grammar itself. Such questions, it is clear, can only be answered by comparing the results gained by the comparative treatment of the grammars of various groups of language. What historical grammar is to comparative grammar, comparative grammar is to universal grammar.

Universal grammar, as founded on the results of the scientific study of speech, is thus essentially different from that "universal grammar" so much in vogue at the beginning of the present century, which consisted of a series of *a priori* assumptions based on the peculiarities of European grammar and illustrated from the same source. But universal grammar, as conceived by modern science, is as yet in its infancy; its materials are still in the process of being collected. The comparative grammar of the Aryan languages is alone in an advanced state, those of the Semitic idioms, of the Ugro-Altaic tongues, and of the Bantu or Kaffre dialects of southern Africa, are still in a backward condition; and the other families of speech existing in the world, with the exception of the Malayo-Polynesian, and the Sonorian of North America, have not as yet been treated scientifically. Chinese, it is true, possesses an historical grammar, and Mr. Van Eys, in his comparative grammar of Basque, has endeavored to solve the problems of that interesting language by a comparison of its various dialects; but in both cases the area of comparison is too small for more than a limited success to be attainable.

It is obvious that grammar constitutes the surest and most important basis for a classification of languages. Words may be borrowed freely by one dialect from another, or, though originally unrelated, may by the action of phonetic decay, come to assume the same forms, while the limited number of articulate sounds and conceptions out of which the language was first developed, and the similarity of the circumstances by which the first speakers were everywhere surrounded, naturally produce a resemblance between the roots of many unconnected tongues. Where, however, the fundamental conceptions of grammar, and the machinery by which they are expressed are the same, we may have no hesitation in inferring a common origin.

The main results of scientific inquiry into the origin and primitive meaning of the forms of Aryan or Indo-European grammar may be summed up as follows. We start with stems or themes, by which are meant words of two or more syllables which terminate in a limited number of sounds. These stems can be classed in groups of two kinds, one in which the groups consist of stems of similar meanings and similar initial syllables, and another in which the final syllables alone coincide. In the first case we have what are termed roots, the simplest elements into which words can be decomposed; in the second case stems proper, which may be described as consisting of suffixes attached to roots. Roots therefore, are merely the materials out of which speech can be made, the embodiments of isolated conceptions with which the lexicographer alone has to deal, whereas stems present us with words already combined in a sentence and embodying the relations of grammar. If we would rightly understand primitive Aryan grammar, we must conceive it as having been expressed or implied in the suffixes of the stems, and in the order according to which the stems were arranged in a sentence. In

other words, the relations of grammar were denoted partly by juxtaposition or syntax, partly by the suffixes of stems.

These suffixes were probably at first unmeaning, or rather clothed with vague significations, which changed according to the place occupied in the sentence by the stem to which they were joined. Gradually this vagueness of signification disappeared, and particular suffixes came to be set apart to represent particular relations of grammar. What had hitherto been expressed by mere position now attached itself to the terminations or suffixes of stems, which accordingly became full-grown words. Some of the suffixes denoted purely grammatical ideas, that is to say, were flexions; others were classificatory, serving to distinguish nouns from verbs, presents from aorists, objects from agents and the like; while others, again, remained unmeaning adjuncts of the root. This origin of the flexions explains the otherwise strange fact that the same suffix may symbolize wholly different grammatical relations. In Latin, for instance, the context and dictionary will alone tell us that *mus-as* is the accusative plural of a noun, and *am-as* the second person singular of a verb, or that *mus-a* is the nominative singular of a feminine substantive, *bon-a* the accusative plural of a neuter adjective. In short, the flexions were originally merely the terminations of stems which were adapted to express the various relations of words to each other in a sentence, as these gradually presented themselves to the consciousness and were extracted from what had been previously implied by position. Necessarily, the same suffix might be used sometimes in a classificatory, sometimes in a flexional sense, and sometimes without any definite sense at all.

GRAMMONT, a town of Belgium, province of East Flanders, is situated on both sides of the Dender, twenty-one miles south-southeast of Ghent. Population (1900), about 10,000.

GRAMONT, PHILIBERT, COUNT DE. A happy accident has preserved for the instruction of mankind rather than for their edification the portrait and the history of a man who entirely represents one section, fortunately a small section, of the society of his day. Of good family, rich, a gallant soldier, endowed with every kind of cleverness, the Count de Gramont endeavored to live the life of unrestrained enjoyment. In this he so far succeeded that, although the following century furnished more numerous examples of his kind, he may be taken as the most finished specimen. His ideal man was a being without conscience, without principle, without religion, without a soul. He crossed over to England during the protectorate of Cromwell. In the year 1662, two years after the restoration of Charles II., he was exiled from the French court, and again repaired to London, where he found such a welcome as was due to his manners, his gayety, his extraordinary good spirits, and his love of gambling, intrigue, gallantry and pleasure. It is the period of his residence at the English court, which forms the greater part of Hamilton's memoirs. In the whole English court there was no one more full of wit, more avid of pleasure, more devoid of all moral restraint, not even Rochester himself, than the Count de Gramont. Naturally, the court being what it was, there was no one more popular. In a court where the women vied with each other for the king's favor, where the men habitually cheated at play, seduced their friends' wives, and corrupted their friends' daughters, that man would be most popular in whom the absence of principle became, by reason of his grace, *esprit*, and elegance, in itself a recommendation. Gramont was as purely a sensualist as any Roman of the later empire.

He married, in London, but, on compulsion, the sister of his future biographer, Miss Hamilton, who, her brother tells us in the memoirs, was able to fix his affections. The statement must be received with some qualifications. The count, it is true, was by no means young when he married. At the same time, he "galantisait" for many years afterward, and, in fact, to the very end of a long life. He was the only old man, says Ninon de l'Enclos, who could affect the follies of youth without being ridiculous. In fact, Gramont, like La Fontaine, was a spoiled child, to whom everything was allowed, and who repaid indulgence by perpetual high spirits, and a continual flow of wit and *bons mots*. At the age of seventy-five he had a dangerous illness, during which he became reconciled, in his way, to the church, but on recovery relapsed into his old habits. At eighty he either dictated or revised his own memoirs, written by his brother-in-law Antony Hamilton. When they were finished he sold the manuscript for 1,500 francs and kept most of the money himself. Fontenelle, then censor of the press, refused to license the work, from considerations of respect to the old man who had so strangely exposed in its pages the whole of his character. These scruples were overcome by the count himself, who had the pleasure of seeing his biography appear in his own lifetime, and of laughing with the rest of the world at his own rogueries at cards, his amorous adventures, and his secret intrigues. He died at the great age of 86.

GRAMPUS, a cetacean belonging to the *Delphinidae* or dolphin family, and characterized by its rounded head with distinct beak, its high dorsal fin, and its large conical permanent teeth. Its upper part is of a nearly uniform glossy black color, and the under part white, with a strip of the same color over each eye.

GRAN, the capital of a county of the same name, seat of the prince primate, and formerly a royal free city, is situated on the right bank of the Danube, nearly opposite the confluence of the Garam (Gran), twenty-five miles northwest of Buda.

GRANADA, a modern province of Spain, consisting of the central portion of the old kingdom of the same name, is bounded on the north and northeast by Jaen, Albacete, and Murcia, on the east by Almeria, on the south by the Mediterranean, and on the west by Malaga and Cordova, having an area of 4,937 English square miles and an estimated population in 1898 of 477,768.

GRANADA, the capital of the above province, is situated at the confluence of the Darro and the Genil, not far from the base of the Sierra Nevada. The more ancient quarters of the town still retain much of the Moorish style, but the modern part is somewhat commonplace. It contains several squares, of which the most remarkable is the Bibarrambla, where tournaments were formerly held. There is also a beautiful shady walk, called the Alameda, which is one of the most frequented promenades. The old city comprises the faubourgs of Antequera, Alcazaba, Alhambra, and Albacin, the last being named after the settlers who came from Baeza, after the capture of that city by St. Ferdinand. For a detailed account of the Alhambra the reader is referred to the special article. The town proper contains a great number of churches and other public edifices. The cathedral, a somewhat heavy and irregular building, was begun in 1529 by Diego de Siloe, and finished in 1639. It is profusely ornamented with jasper and colored marble and surmounted by a dome; and it contains several valuable paintings by Alonso Cano, portraits of Ferdinand and Isabella by Rincon, and marble statues of several kings and queens of Spain. In one of its numerous chapels (the Chapel Royal) are buried their "Catholic Majesties," and Philip and Juana. Population (1898), 75,054.

GRANADA, a city of Central America, state of Nicaragua, is situated on the northwest bank of the Lake of Nicaragua, thirty miles north-northwest of the town of that name. Population (1900), 25,000.

GRANADA, LUIS DE, a Spanish preacher and ascetic writer, born of poor parents at Granada in 1504. Having been invited by Cardinal Henry, infanta of Portugal and archbishop of Evora, to Badajoz in 1555, he founded a monastery there, and two years later was elected provincial of Portugal. He was also appointed confessor and councilor to the queen regent, but he declined promotion to the archbishopric of Braga, and on the expiry of his provincial office in 1561 he retired to a Dominican convent at Lisbon, where he died in 1588.

GRANADILLA, the name applied to *Passiflora quadrangularis*, Linn., a plant of the natural order *Passifloraceae*, a native of tropical America. It bears a large, oblong fruit, containing numerous seeds, imbedded in a subacid edible pulp.

GRAN CHACO, an extensive region in the heart of South America, which belongs partly to Bolivia and partly to the Argentine Republic, the boundary between the two states coinciding with the parallel 22°. The area is estimated at about 425,000 square miles.

GRAND ARMY OF THE REPUBLIC, An organization composed of the survivors of the Union army in the Civil war, was first suggested, it is claimed, during 1864, by the Rev. W. J. Rutledge, chaplain of the fourteenth regiment of Illinois infantry. During the continuance of hostilities the formulation of plans looking to the establishment of a society of veterans was not attempted. In the winter of 1865-66 the matter was revived by ex-soldiers, and considerable correspondence was had in the premises. During February of the latter year, Dr. B. F. Stephenson, Maj. Robert M. Woods, and others representing Illinois regiments took the preliminary steps. A charter was obtained and on April 6, 1866, the pioneer post of the Grand Army of the Republic began its organic existence at Decatur, Ill., twelve members being mustered in by Doctor Stephenson.

It should here be stated that the society was designed to be a secret order and its proceedings were conducted accordingly.

On May 16th of the same year the constitution of the order, together with a declaration of principles, was printed and promulgated. The former sets forth the plan of organization and the latter the objects for which the society was specially created. Posts organized in a city, town, township, ward or precinct were to be known as precinct organizations; county organizations as district posts; State organizations as departments, and the national organization as "The Grand Army of the Republic." Each organization was to be under the direction of certain designated officers and was entitled to certain representation, each district being entitled to one delegate in the department organization which convened each year, while the national organization was to be composed of two delegates from each department. The declaration of principles was substantially as follows:

First.—To preserve and strengthen those kind and fraternal feelings which bind together the soldiers, sailors, and marines who united to suppress the late rebellion and to perpetuate the history and memory of the dead.

Second.—To assist such former comrades-in-arms as need help and protection, and to extend needful aid to the widows and orphans of those who have fallen.

Third.—To maintain true allegiance to the United States of America, based upon a paramount respect for and fidelity to the National constitution and laws; to discountenance whatever tends to weaken loyalty, incites to insurrection, treason and rebellion, or in any manner impairs the efficiency or permanency of our free institutions, and to encourage the spread of universal liberty, equal rights and justice to all men.

Some weeks later Post No. 2 of the Grand Army was instituted at Springfield with 27 charter members and the following officers: T. S. Mather, post commander; E. J. Johnson, adjutant; W. E. Fitzhugh, officer of the day; and William T. Prescott, quartermaster.

On July 12, 1866, the members of the Grand Army in Illinois met in convention at Springfield, at which time the principles set forth in the above declaration were re-affirmed and emphasized, and other proceedings were had, including the completion of arrangements for the organization of posts in other States. In pursuance of the latter the work of establishing branch organizations was entered upon and by November, 1866, departments were established throughout Illinois and the States adjoining, and posts in a number of the Eastern, Western and Southwestern States.

The first National Encampment of the Grand Army was held at Indianapolis, beginning November 20, 1866, Morrison's Opera House being appropriated to the uses of the society. At this meeting the National organization was perfected. No National Encampment was held in 1868, but each year since it has been convened with gratifying results.

To the efforts of members of the Grand Army, it is claimed, is due the general observance of May 30th of each year as "Decoration Day." In the spring of 1868, according to the records of the society, this matter was first considered, and on the 5th of May of the same year, General Logan, commander-in-chief, issued a general order in which "the 30th of May, 1868, is designated for the purpose of strewing with flowers or otherwise decorating the graves of comrades who died in defense of their country during the late rebellion, and whose bodies now lie in almost every city, village and hamlet church-yard in the land."

Ceremonies at and in the decoration of the graves of soldiers had been observed in various portions of the country previous to the issuance of the order above quoted, but united action in the premises was heretofore wanting. The day has since been annually set apart for the purpose of strewing with flowers the graves of both the Union and Confederate Soldiers who fell in the battles of the Civil war. In many of the States May 30th has been made a legal holiday.

The commanders-in-chief of the Grand Army and the place of holding the annual encampment at which each was elected, have been as follows:

1. Stepen A. Hurlbut, of Illinois, Indianapolis; November 20, 1866.

2. John A. Logan, of Illinois, Philadelphia; January 15, 1868; reelected (3) at Cincinnati, May 12, 1869; and again (4) at Washington, May 11, 1870; died December 26, 1886.

5. Ambrose E. Burnside, of Rhode Island, Boston; May 10, 1871; reelected (6) at Cleveland May 8, 1872; died September 3, 1881.

7. Charles Devens, Jr., of Massachusetts, New Haven, Conn.; May 14, 1873; reelected (8) at Harrisburg, Pa., May 13, 1874.

9. John F. Hartranft, of Pennsylvania, Chicago; May 12, 1875; reelected (10) at Philadelphia, June 30, 1876.

11. John C. Robinson, of New York, Providence, R. I.; June 26, 1877; reelected (12) at Springfield, Mass., June 4, 1878.
13. William Earnshaw, of Ohio, Albany, N. Y.; June 17, 1879.
14. Louis Wagner, of Pennsylvania, Dayton, O.; June 8, 1880.
15. George S. Merrill, of Massachusetts, Indianapolis; June 15, 1881.
16. Paul Vandervoort, of Nebraska, Baltimore; June 21, 1882.
17. Robert B. Beath, of Pennsylvania, Denver; July 25, 1883.
18. John S. Kountz, of Ohio, Minneapolis; July 23, 1884.
19. S. S. Burdette, of Washington, D. C., Portland, Me.; June 24, 1885.
20. Lucius Fairchild, of Wisconsin, San Francisco; August 5, 1886.
21. John P. Rea, of Minnesota, St. Louis; September 29, 1887.
22. William Warner, of Kansas City, Mo., Columbus, Ohio; September 13, 1888.
23. R. A. Alger, of Michigan, Milwaukee; August 17, 1889.
24. W. G. Veazey, of Vermont, Boston; August 1890.
25. Jno. Palmer, of N. Y.; Detroit, 1891.
26. A. G. Weissert, of Wis.; Washington, 1892.
27. J. G. B. Adams, of Mass.; Indianapolis, 1893.
28. T. G. Lawler, of Ill.; Pittsburgh, 1894.
29. I. N. Walker, of Ind.; Louisville, 1895.
30. T. S. Clarkson, of Neb.; St. Paul, 1896.
31. J. P. S. Gobin, of Pa.; Buffalo, 1897.
32. J. A. Sexton, of Ill.; Cincinnati, 1898.
33. W. C. Johnson, of Ohio; Cincinnati, 1898.
34. A. D. Shaw, of N. Y.; Philadelphia, 1899.
35. Leo Rassieur, of Mo.; Chicago, 1900.
36. Eli Torrance, of Minn.; Denver, 1901.

The growth of the Grand Army has been continuous since the date of its inception as an organization, and the influence exerted by members, posts and departments has been potent and widely extended. It is represented by posts in every State and Territory at the North and in many of the Southern States.

Changes have been made in the constitution and laws of the association, as the occasion required, but little has occurred to disturb the harmony and good fellowship which has characterized the career of the organization.

GRAND'COMBE, a town of France, and is situated on the Gardon. Population about 6,500.

GRAND FORKS, the capital of Grand Forks county, North Dakota, and the center of the most productive wheat growing region of the Northwest, is situated at the head of navigation, on the Red River of the North, and on the Grand Forks division of the St. Paul, Minneapolis and Manitoba, and the Northern Pacific railroads. During the summer season steamers ply regularly between Grand Forks and Fargo, also between Grand Forks and Pembina. The city contains two daily, four weekly and one monthly publications, three national banks, a court-house, United States land office, three hotels and two public halls, besides churches, schools, stores, elevators and some lines of manufacture, principally lumber and lumber products, engines, boilers, etc. The Pop. (1900), 7,652.

GRAND ISLAND, capital of Hull county, Nebraska, is situated on the Platte river, 154 miles west of

Omaha. It is also on the Union Pacific, St. Joseph and Grand Island, and Burlington and Missouri River railroads. The country surrounding is highly productive and thickly settled. The city contains five banks, one daily and five weekly papers, eight hotels, an opera house, academy of music, public halls, churches of every denomination, high, intermediate and primary schools, and manufactures of machinery, cornices and ornamental iron. Population (1900), 7,554.

GRAND HAVEN, capital of Ottawa county, Michigan, is situated on Lake Michigan, at the mouth of Grand river, opposite Milwaukee, to which, as well as to the other principal towns on the lake, several steamers ply daily. It is a station of the Chicago and West Michigan, and the terminus of the Detroit, Grand Haven and Milwaukee line. It has one daily and three weekly papers, one national bank, a court-house, thirteen churches, a high school and graded schools, a number of fine hotels, and handsome private residences. It has saw and shingle mills, and manufactures of agricultural implements, of sashes and blinds, and of windmills. Shipbuilding is also carried on. In the neighborhood there are extensive peach orchards. Lumber and fruit are the principal shipments. Population (1900), 4,743.

GRANDMONTANES, or GRAMMONTINES (Ordo Grandimontensis), a small religious order confined almost entirely to France. Its origin is involved in some obscurity.

GRAND RAPIDS, the county seat of Kent county, Michigan, has grown with great rapidity since its incorporation in 1850. It is situated on both sides of the Grand river, about forty miles from its mouth, and 153 miles west-northwest from Detroit. At this point the river, which is navigable above and below the rapids, has a fall of eighteen feet within a mile. This affords an excellent motive power, which has been generally utilized for manufacturing purposes. The city is the point of intersection of six railroads. Its manufactures include a great variety of woodenware, furniture, carriages, wagons, agricultural implements, machinery, chemicals, leather, beer, barrels and bricks, representing a capital of \$17,227,000, and producing an annual output worth \$32,432,000. Grand Rapids contains the United States courts for Western Michigan. It has five national and two other banks, first-class water supply, twenty-three public schools costing \$720,000, a city library containing 22,500 volumes, and a scientific institution, six daily and twenty weekly newspapers, and well organized police and fire departments. It is the seat of the Protestant Episcopal bishop of Western Michigan and contains sixty-nine churches. Among the prominent public buildings are the city-hall, court-house, soldier's home, masonic home, orphan asylum, post-office and other structures. The city is provided with gas and electric light plants, sixty-six miles of water mains, twenty-three miles of sewers, sixty miles of street railways. The assessed value of property was \$21,794,612 in 1890, and the city tax-rate for the same year was \$2.80 per \$100. Population (1900), 87,565.

GRANDSON. See GRANSON.

GRANDVILLE. See GERARD, JEAN I. I.

GRANET, FRANCOIS MARIUS, was born at Aix in Provence, on December 17, 1777; his father was a small builder, but the boy's own strong desires led his parents to place him in a free school of art directed by M. Constantin, a landscape painter of some reputation who lived in the town. In 1793 Granet followed the volunteers of Aix to the siege of Toulon, at

the close of which he obtained employment as a decorator in the arsenal. While yet a lad he had, at Aix, made the acquaintance of the young Comte de Forbin, and it was upon his invitation that Granet, in the course of the year 1797, proceeded to Paris. De Forbin was one of the pupils of David, and Granet entered the same studio. Later on he got possession of a cell in the convent of Capuchins, which, having served for a manufactory of assignats during the revolution, was afterward inhabited almost exclusively by artists. In the changing lights and shadows of the corridors of the Capuchins, Granet found the materials for that one picture to the painting of which, with varying success, he devoted his life. In 1802 he left Paris for Rome, where he remained until 1810, when he returned to Paris, bringing with him, besides various other works, one of fourteen repetitions of his celebrated Chœur des Capucins, executed in 1811. The figures of the monks celebrating mass are taken in this subject as a substantive part of the architectural effect, and this is the case with all Granet's works, even with those in which the figure subject would seem to assert its importance, and its historical or romantic interest. He became member of the Institute in 1830; but in spite of these honors, and the ties which bound him to M. de Forbin, then director of the Louvre, Granet constantly returned to Rome. After 1848 he retired to Aix, immediately lost his wife, and died on November 21, 1849.

GRANGERS, a secret society composed of farmers, and properly known as "Patrons of Husbandry." The organization grew out of the depressed condition of agriculture following the war and the financial panic of 1873. It was formed in Washington, D. C., in December, 1867, by seven persons, chief of whom was O. H. Kelly, a clerk in United States Department of Agriculture. The original scheme contemplated National, State, and local granges, to which both men and women should be eligible for membership. As usual a ritual with passwords and grips was provided. This movement was at first largely social, politics being left out professedly. Some attempts were made to establish coöperative stores, and there was a strong endeavor in various ways to carry out the motive idea of making the agriculturist largely a man independent of all other occupations. Journals were established devoted to the interests of the order, which attained a membership of more than a million.

But it is now seen that the organization of Patrons of Husbandry was inadequate to allay a widely-spreading discontent among the farming class, and the society declined, the feeling which organized it taking a much deeper tone, with a steady drift toward an organization declaredly radical and political. This feeling, growing continually, was in favor of excluding from membership with the farmers of all professional persons not farmers, and thus the old politicians who are ever desirous of using a public sentiment for personal advantage. About 1889 it began to be known that an organization existed known as the "Farmers' Alliance," whose purposes were not social, and whose aims were radical and undisguisedly political. Two years later this organization began to be known as the Populist Party—the party of the People. It opposes all other parties, refuses to recognize the politicians and politics of these parties, and creates them anew for itself as emergencies arise.

This organization became fairly strong in two or three of the northwestern States, and was presumably so in the South, but was especially active in Kansas, from which, as the first effort of the party, a Senator and a majority of representatives were elected to congress. This strength was a surprise to the dominant party,

which surprise was not abated by the election of a governor and the State officers, with a disputed majority in both houses of the Legislature, in November, 1892. This state of affairs culminated in violence during the session of the Legislature of the winter of 1892-93, the republicans being blockaded and besieged in the Hall of Representatives at Topeka, the militia being called out by the governor, but virtually refusing to act, crowds of armed citizens flocking to the scene from all parts of the State, but finally a compromise without violence and a finishing of legislative business, being incidents of the occasion.

The causes of the rebellion of the farmers against all the old parties are complicated and many, but are chiefly to be traced to a dissatisfaction in respect to railroad oppressions and commercial trusts.

GRANITE, a rock so named from the Latin *granum*, a grain, in allusion to the granular texture of many of its varieties. The term appears to have been introduced by the early Italian antiquaries, and it is believed that the first recorded use of the word occurs in a description of Rome by Flaminius Vacca, an Italian sculptor of the sixteenth century. Granite is also referred to by Cæsalpinus (1596), and by Tournefort (1698); indeed the latter has been cited by Emmerling as the first author who uses the term. By these early writers, however, the name was loosely applied to several distinct kinds of granular rock, and it remained for Werner to give it that precise meaning which it at present possesses as the specific designation of a rock.

Granite is a crystalline-granular rock consisting, in its typical varieties, of orthoclase, quartz, and mica, to which a plagioclastic feldspar is usually added. These minerals are aggregated together without the presence of any matrix or connecting medium. Thin sections of a true granite, examined under the microscope, by transmitted light, show no trace of any amorphous or crypto-crystalline ground mass. The chemical composition of the rock will, of course, vary with its mineralogical constitution. The proportion of silica varies from 62 to 81 per cent. Granite belongs therefore to Bunsen's class of *acid* rocks, or those which contain more than 60 per cent. of silica.

Orthoclase, or potash feldspar, is the principal constituent of most granites. This mineral occurs either in simple crystals, or in twains formed on what is known as the "Carlsbad type," such crystals being common at Carlsbad in Bohemia. The green feldspar known as Amazon stone, which occurs in certain granites, has lately been shown by Des Cloiseaux to belong to the species *microcline*, and not, as previously supposed, to orthoclase. The plagioclastic, anorthic, or triclinic feldspar of granite occurs in crystals which are generally smaller than those of the orthoclase, and which exhibit, even to the naked eye, their characteristic twin striation. Moreover the luster is frequently resinous or fatty, while that of the orthoclase is pearly on the cleavage-planes. In most cases the plagioclase is the soda-line feldspar called *oligoclase*; but in some granites it is *albite* or soda feldspar, as shown by Haughton in many of the Irish and Cornish granites. When a granite becomes weathered, the feldspar may decompose into *kaolin* or *china-clay*; the commencement of this alteration is indicated under the microscope by the turbidity of the feldspar, by the ill-defined edges of the crystals, and in the case of plagioclase by disappearance of the characteristic striae.

The quartz of granite occurs generally in irregularly-shaped angular grains; but occasionally in distinct crystals which are double hexagonal pyramids with or without the corresponding prism. Colorless quartz is most common, but gray, brown, or bluish varieties also

occur. Whatever its color, it is as a rule transparent in microscopic sections, though sometimes rendered milky by the presence of vast numbers of minute cavities containing liquid. In many granites the quartz fills up the spaces between the crystals of felspar and of mica, and receives impressions from these minerals.

Few questions have been more warmly discussed than the origin of granite. When this rock is found forcing its way through older rocks, and appearing at the surface in large bosses from which veins are sent forth in all directions, there can be little doubt of its eruptive character. The small width of some of these granitic veins, or apophyses, suggests that the rock must have existed in a condition of perfect fusion or complete liquidity, and not simply as a viscous paste, before it could have been injected into such narrow fissures as those which are now occupied by granite. In many cases, the rocks which are penetrated by the granitic veins are altered in such a manner as to indicate a considerable elevation of temperature; a limestone in the neighborhood of the veins may become saccharoidal, and shales may become indurated or even converted into hornstone, while new minerals are often developed in the vicinity of the intruded veins. In these veins the granite is apt to change its mineralogical constitution, becoming either fine-grained or felsitic, or even reduced at the extremities of the vein of quartz. From the days of Hutton it has been generally admitted that most granite is of igneous origin. Since it appears to have been solidified at great depths beneath the surface, it has been distinguished as a *plutonic* rock, while those eruptive rocks which have risen to the surface, and have there consolidated, are termed *volcanic* rocks. The older geologists regarded granite as the primitive rock of the earth's crust, forming the floor of all stratified deposits and the nucleus of mountain chains. Such a view, however, has been long exploded. It is known indeed that granite, so far from being in all cases an original rock, may be of almost any geological age. Some is undoubtedly as old as the Silurian period, while other granites are certainly as young as the Tertiary rocks, and perhaps of even more recent date. By many field-geologists granite has of late years been regarded as a metamorphic rather than as a truly igneous rock. Metamorphism, however, is a term which has been so vaguely used that most of our eruptive rocks may, in a certain sense, be said to be metamorphic. Still, in the case of granite, it has often been pointed out that a passage may be traced from this rock into gneiss, and that gneiss itself may be regarded as an altered sedimentary rock.

GRAMMICHELE, or GRAMMICHELE, a market town of Sicily, in the province of Catania, about eight miles from Caltagirone on the road to Catania.

GRANSON, GRANDSON, or GRANDSEE, a small town in Switzerland, canton of Vaud, is situated near the southwestern extremity of the Lake of Neuchâtel. It possesses the ruins of an old castle, containing a collection of antiquities, and has a very ancient church, once connected with a Benedictine abbey, with a number of pre-Christian images, but has fallen into decay. The town is of Roman origin.

GRANT, MRS. ANNE, a Scottish authoress, generally known as Mrs. Grant of Laggan, was born at Glasgow, February 21, 1755. In 1779 Anne married the Rev. Mr. Grant of Laggan, near Fort Augustus, Inverness, and on his death, in 1801, she was left with a large family and only a very small income. It being known to several of her friends that she occasionally wrote verses, a proposal was made that she should publish a volume of poems, and names of as many as 3,000

subscribers were obtained. The volume appeared in 1803 under the title of *Original Poems, with some Translations from the Gaelic*, and met with a rather favorable reception, on account of its easy versification and the truth and tenderness of the sentiment of some of its smaller pieces. In 1806 she published *Letters from the Mountains, being a Selection from the Author's Correspondence with her Intimate Friends from 1773 to 1804*, which, by its spirited descriptions of Highland scenery, character and legends, awakened a large amount of interest. Her other works are *Memoirs of an American Lady, with Sketches of Manners and Scenery in America as they existed previous to the Revolution* (1808), containing reminiscences of her stay with Mrs. Schuyler, the lady with whom she spent four years of her childhood in America; *Essays on the Superstitions of the Highlanders of Scotland* (1811); and *Eighteen Hundred and Thirteen, a Poem* (1814). She died November 7, 1838.

GRANT, SIR FRANCIS, an English portrait painter, and president of the Royal Academy in London, was the fourth son of Francis Grant of Kilgraston, Perthshire, and was born at Edinburgh in 1803. On completing a course of instruction he removed to London, and as early as 1843 exhibited at the Royal Academy. At the beginning of his career he utilized his sporting experiences by painting groups of huntsmen, horses, and hounds; and doubtless if he had chosen to devote himself to the careful treatment of this class of subjects his success might have been more thorough and permanent, if less brilliant and lucrative, than it was. If, however, the reputation he acquired as a fashionable portrait-painter was aided by his social position and gentlemanly manners, it rested also on certain special artistic qualifications. The first and chief of these, was his power of thoroughly reproducing the outward tone and manner of fashionable life, or, as Sir Walter Scott called it, his "sense of beauty derived from the best source, that is, the observation of really good society." If also his execution was superficial and thin, it was bright, clear, facile, and unconstrained. In drapery he had the taste of a connoisseur, and rendered the minutest details of costume with felicitous accuracy. In female portraiture he achieved considerable success, although rather in depicting the highborn graces and external characteristics than the true and individual personality. In 1842 he was elected an associate, and in 1851 an Academician; and in 1866 he was chosen to succeed Sir C. Eastlake in the post of president. Shortly after his election as president he received the honor of Knighthood, and in 1870 the degree of D.C.L. was conferred upon him by the university of Oxford. He died October 5, 1878.

GRANT, SIR JAMES HOPE, an English general, brother of the preceding, was born July 22, 1808. In 1842 he acted as brigade-major to Lord Saltoun in the Chinese War, and specially distinguished himself at the capture of Chin-Keang, after which he received the rank of major and was nominated companion of the bath. In the first Sikh War of 1845-46 he took part in the battle of Sabraon; and in the Punjab campaign of 1848-1849 he held command of his old regiment, the Ninth Lancers, and won high reputation in the battles of Chillianwalla and Gugarat. In 1854 he became brevet-colonel, and in 1856 brigadier of cavalry. He took a leading part in the suppression of the Indian mutiny of 1857, holding for some time the command of the cavalry division, and afterward of a movable column of horse and foot. After rendering valuable service in the operations before Delhi and in the final assault on the city, he directed the victorious march of the cavalry and horse artillery dispatched in the direction of Cawnpore to open up communication with the commander.

in chief, Sir Colin Campbell, whom he met near the Alumbagh, and who raised him to the rank of brigadier-general, and placed the whole force under his command during what remained of the perilous march to Lucknow for the relief of the residency. In 1859 he was appointed to the command of the British land forces in the united French and British expedition against China, whose object was accomplished three months subsequent to the landing of the forces at Peh-tang, August 1, 1860, Pekin having surrendered at discretion after the Chinese army had thrice suffered defeat in the open and the Taku forts had been carried by assault. For his conduct in this war he received the thanks of parliament, and was gazetted G.C.B. In 1861 he was made lieutenant-general and appointed commander-in-chief of the army of Madras; on his return to England in 1865 he was made quartermaster-general at headquarters; and in 1872 he was transferred to the command of the camp at Aldershot. In the same year he was gazetted general. He died at London, March 7, 1875.

GRANTHAM, a municipal and parliamentary borough and market-town of England, county of Lincoln, is situated on both sides of the Witham, at the junction of several railways, one hundred and five miles north-northeast of London and twenty-two miles south-southwest of Lincoln. Population, 15,000.

GRANVELLA, ANTOINE PERRENOT, CARDINAL DE, one of the ablest and most influential of the princes of the church during the great political and ecclesiastical movements which immediately followed the appearance of Protestantism in Europe, was born August 20, 1517, at Ornans, Burgundy, where his father, Nicolas Perrenot de Granvella, who afterward became chancellor of the empire under Charles V., was at that time engaged in practice as a junior at the provincial bar. On the completion of his studies in law at Padua, and in divinity at Louvain, he for a short time held a canonry at Besançon, but his talents had already marked him for a higher sphere, and he was promoted to the bishopric of Arras when barely twenty-three (1540). One of his specially noteworthy performances was the settlement of the terms of peace after the defeat of the Smalkaldic league at Mühlberg in 1547, a settlement in which, to say the least, some particularly sharp practice was exhibited. In 1550 he succeeded his father in the offices of secretary of state and chancellor of the empire; in this capacity he attended Charles in the war with Maurice, accompanied him in the flight from Innsbruck, and afterward drew up the treaty of Passau (August, 1552). In the following year he conducted the negotiations for the marriage of Mary of England and Philip of Spain, to whom in 1555, on the abdication of the emperor, he transferred his services. In April, 1559, Granvella was one of the Spanish commissioners who arranged the peace of Cateau Cambrésis, and on Philip's withdrawal from the Netherlands in August of the same year he was appointed prime minister to the regent, Margaret of Parma. In 1560 he was elevated to the archiepiscopal see of Malines, and in 1561 he received the cardinal's hat. In 1564 he retired to Franche Comté. Nominally this withdrawal was only of a temporary character, but it proved to be final. The following six years were spent in comparative quiet, devoted chiefly to study; but in 1576 Granvella, at the call of Philip, resumed public life by accepting a mission to Rome as representative of the interests of Spain in framing the proposed treaty of alliance with Venice and the papal see against the Turks. In the same year he was advanced to the viceroyalty of Naples, which for five years he occupied with ability and success. Summoned to Madrid in 1575, to be president of the supreme council of Italy, and afterward of that of Castile, he still con-

tinued to find ample scope for his rare aptitudes. Among the more delicate negotiations of his later years were those of 1580, which had for their object the ultimate union of the crowns of Spain and Portugal, and those of 1584, which resulted in a check to France by the marriage of the Spanish infanta to Duke Philip of Savoy. In the same year he was made archbishop of Besançon, but never was enthroned, and died at Madrid September 21, 1586.

GRANVILLE, a fortified seaport town of France, department of Manche, is situated at the mouth of the Bosq and at the foot of a steep rocky promontory projecting into the English Channel, thirty miles southwest of St. Ló. Population 13,000.

GRANVILLE, JOHN CARTERET, EARL, English statesman, son of George, Lord Carteret, was born April 22, 1690, and in his fifth year succeeded to his father's title. Soon after taking his seat in the House of Lords in 1711, he began to distinguish himself by his eloquent advocacy of the Protestant succession, and his zeal was rewarded when George I. came to the throne, by the appointment in 1715 of bailiff of the island of Jersey, and in 1716 of lord-lieutenant of Devon; and his mother was also created countess of Granville. In 1719 he was sent on an embassy to Sweden; and in 1720 he was named ambassador-extraordinary to the congress of Cambray. In May of the following year he was appointed secretary of state under Walpole's administration; but Walpole's jealousy of his influence with the king led to his resignation on April 3, 1724, and on the same day he was appointed lord-lieutenant of Ireland, an office which he held till 1730, when differences with the ministry led to his resignation. After his return he became the leader of the opposition. In 1742 he was at last successful in overthrowing Sir Robert Walpole's Government, and was immediately thereafter appointed secretary of state. He now obtained a complete ascendancy over the mind of George II., whose German policy he carried out irrespective of the opinions of his colleagues; but his imperiousness soon gained him both their enmity and the hatred of the people, and enabled his opponents, for whom he cherished unmitigated contempt, to effect his political annihilation.

In 1744 he found it necessary, from the resignation of his colleagues and his inability to find proper successors, to tender his resignation; and, according to Horace Walpole, he "retired from St. James' laughing." Shortly before this he had, by the death of his mother, become Earl Granville. His administration was popularly distinguished by the epithet "drunken"—a title which had reference to his character both as a politician and as a private individual. In 1749 he was created knight of the garter and appointed president of the council; but, though he retained his influence with the king, the part he thenceforth played in English politics was indirect and subordinate. He died January 2, 1763.

GRAPE. See VINE.

GRAPHITE. See CARBON and FURNACE.

GRAPHOTYPE is a name which has been given to an ingenious process of autographic engraving, by which typographic printing blocks are produced. The general principles of the process are as follows: A block of chalk or some similar material is reduced to a level surface, and on this surface a design is drawn with a glutinous ink, this ink being sufficiently fluid to penetrate some little distance into the porous chalk. The ink having become dry, gentle friction is applied to the surface of the block, so as gradually to rub away those parts of the chalk which are not indurated by the glutinous ink. The lines of the drawing being thus left in relief, a perfect model of the required printing block is obtained, and this model is next hardened by im-

mersion in a bath containing a solution of an alkaline silicate, after which it is dried and reproduced by the stereotype or electrotype process. This method of typographic engraving was brought to a practical form and patented in 1860 by an American wood engraver, Mr. de Witt Clinton Hitchcock. The first step in his process is to reduce French chalk or talc to an extremely fine state of division by repeated grindings, elutriations and siftings, after which a layer of the material, rather over an eighth of an inch in thickness, is forced down upon, and made to adhere to, a thick zinc plate—the necessary pressure being obtained by means of an hydraulic press, the platen of which is faced with a polished steel plate, so as to communicate a good surface to the layer of compressed French chalk. The device is now drawn (of course, reversed) on the prepared block with an ink consisting of a weak solution of glue colored by lamp-black or some other pigment. In drawing on the prepared block care must be taken not to damage the somewhat tender surface of the compressed chalk, and the safest instrument with which to apply the glutinous ink is a fine sable brush, but an ordinary pen may be employed if the operation of drawing is performed with caution. A pad of silk velvet or a fitch brush may be used for rubbing the block so as to leave the lines in relief, and it is quite sufficient to continue the friction until a depth equal to the thickness of an ordinary playing card is produced—the spaces corresponding to any extended whites of the engraving being then cut out by means of a tool. A 10-per cent. solution of silicate of sodium may be used for hardening the block, and when dry, nothing remains but to take a mold from it and to reproduce it in metal.

GRASLITZ, or GRASSLITZ (Bohemian *Kraslice*), a town in the northwest of Bohemia, near the Saxon frontier, in the circle of Elbogen, eighty-eight miles northwest of Prague.

GRASSE, a town of France, capital of an arrondissement in the department of Alpes-Maritimes, twenty miles west of Nice.

GRASSES are monocotyledonous flowering-plants, possessing certain characters in common, and constituting the order *Gramineæ*. No plant is correctly termed a grass which is not a member of this family, but the word is in common language also used, generally in combination, for many plants of widely different affinities which possess some resemblance (often slight) in foliage to truly graminaceous species; e.g., knot-grass, cotton-grass, rib-grass, scorpion-grass, sea-grass. In agriculture the word has an extended signification to include the various fodder-plants, chiefly leguminous, often called "artificial grasses." Indeed, formerly *grass* (also spelt *gawrs*, *gres*, *gyrs*, in the old herbals) meant any green herbaceous plant of small size.

Grasses are the most universally diffused over the globe of all flowering-plants. There is no district in which they do not occur, and in nearly all they are a leading and dominant feature of the flora. In actual number of species *Gramineæ* comes considerably after *Compositæ* and *Leguminosæ*, the two most numerous orders of phanerogams, but in number of individual plants it probably far exceeds either; while from the wide extension of many of its species, the proportion of *Gramineæ* to other orders in the various floras of the world is much higher than its whole number of species would lead one to expect. This number can, however, scarcely be put much below 6,000, which is probably somewhat more than a fifth of all monocotyledons. This is only about $\frac{1}{10}$ th of the phanerogams as a whole, yet in any given locality, with a very few exceptions, this proportion is largely exceeded. In tropical regions, where *Leguminosæ* is the leading order, grasses closely

follow as the second, while in the warm and temperate regions of the northern hemisphere, in which *Compositæ* takes the lead, *Gramineæ* again occupies the second position. As the colder latitudes are entered the grasses become relatively more numerous, and are the leading family in Arctic and Antarctic regions. The only countries where the order plays a distinctly subordinate part are some extra-tropical regions of the southern hemisphere, Australia, the Cape, Chili, etc.

The principal climatic cause influencing the number of graminaceous species appears to be amount of moisture; it is only in very dry countries that they become distinctly less numerous. A remarkable feature of the distribution of grasses is its uniformity; there are no great centers for the order, as in *Compositæ*, where a marked preponderance of endemic species exists; and the genera, except some of the smallest or monotypic ones, have usually a wide distribution. Speaking generally, however, the *Panicaceæ* are tropical and warm temperate plants, while the grasses of temperate and colder regions are members of the *Poaceæ*. The former are very sparingly represented in Europe by a few species of the vast tropical genera *Andropogon* and *Panicum*. *Poaceæ*, on the other hand, form a fair proportion of tropical *Gramineæ*, especially in the higher districts, where, as in the mountains of Abyssinia, are several endemic genera and many species. The largest tropical genus of *Poaceæ* is *Eragrostis*.

The native and cultivated forage grasses of the United States are of vast importance, and form a great proportion of the agricultural wealth of the country. Probably five hundred million dollars is not too high an estimate to put upon the annual value of the grass and hay crop. Among the most widely distributed of the American grasses is Timothy or Herd's-grass, said to have been first found in New York or Virginia, which is probably unsurpassed as a material for hay. It thrives best on moist loam, and not so well on light sandy soils. Red-top is often grown in connection with Timothy. Orchard grass, one of the most valuable of the pasture grasses, is preferred to almost any other by good judges. It grows rapidly and blossoms early. Meadow-Spear is a native American grass, and Meadow Fescue forms excellent pasture.

Of the rye grasses the Perennial and Italian varieties are favorites. Lucerne, originally found in Asia, is now cultivated in all temperate climes. It requires a rich soil and grows under favorable circumstances with great luxuriance. Under the name of Alfalfa it forms the chief grass crop of California. All the varieties of clover are in request for stock, and the Bluegrass of Kentucky is famous the world over. In Texas, and other Southwestern States, vast herds of cattle find sustenance in the native mesquite or bunch grass—having no other food the year around.

GRASSHOPPER, a collective term applied to certain orthopterous insects belonging to the families *Locustidæ* and *Acrydiidæ*, according to the now generally received classificatory views. They are especially remarkable for their saltatory powers, due to the great development of the hind legs, which are much longer than the others and have stout and powerful thighs, and also for their stridulation, which is not always an attribute with them of the male only. The distinctions between the two families may be briefly stated as follows:—the *Locustidæ* have very long thread-like antennæ, and four-jointed tarsi; the *Acrydiidæ* have short stout antennæ, and three-jointed tarsi. As the term "grasshopper" is almost synonymous with *LOCUST*, the subject will be more extensively treated under the latter heading. Under both "grasshopper" and "locust" are included members of both families above

noticed, but the majority belong to the *Acrydiida* in both cases.

GRASS VALLEY, a town of Nevada county, California, is situated on the Nevada County Narrow Gauge railroad, sixty miles northeast of Sacramento. One daily and two weekly papers are issued, and two banks are in operation. The city contains seven churches, a Roman Catholic cathedral, convent, and orphan asylum, together with schools, hotels, stores, two smelters, two foundries, and manufactures of lumber, tinware, etc. Population, (1900), 4,719.

GRATIANUS, AUGUSTUS, Roman emperor, son of Valentinianus I., was born in 359. In the ninth year of his age he received from his father the title of Augustus, but on his father's death in 375 he was compelled to share the Western empire with his infant brother, Valentinianus II., of whom he was appointed guardian, while his uncle Valens ruled over the Eastern empire. In 378 he gained a victory over the Alemanni near the site of the present town of Colmar. Through the death of Valens in the same year, there devolved upon him the government of the Eastern empire, but feeling himself unable to resist unaided the incursions of the barbarians, he ceded it to Theodosius, January 19, 379. By adopting as the guards of his person a body of the Alani, and appearing in public in the dress of a Scythian warrior, he awakened the contempt and resentment of his Roman troops. A Roman named Maximus took advantage of this feeling to raise the standard of revolt in Britain, and invaded Gaul with a large army, upon which Gratianus, who was then in Paris, being deserted by his troops, fled to Lyons, where, through the treachery of the governor, he was delivered over to one of the rebel generals and assassinated, August 25, 383.

GRATIANUS, FRANCISCUS, compiler of the *Concordia discordantium Canonum* or *Decretum Gratiani*, and founder of the science of canon law, was born about the end of the eleventh century at Chiusi in Tuscany, or, according to another account, at Carraria near Orvieto. In early life he appears to have been received into the Camaldulian monastery of Classe near Ravenna, whence he afterward removed to that of San Felice in Bologna, where he spent many years in the preparation of the *Concordia*. The precise date of this important work cannot be ascertained, but it contains references to the Lateran council of 1139.

GRATIUS FALISCUS, a Roman poet, contemporary with Virgil and Ovid, and author of a poem on hunting (*Cynegetica*), of which somewhat more than 536 lines have been preserved. Of his personal history nothing is known; but it has been doubtfully conjectured from his cognomen that he was a native of Falerii.

GRATTAN, HENRY, Irish statesman and orator, was born July 3, 1746. His father, a Protestant, was for many years recorder of the city of Dublin, and from 1761 to 1766 its representative in the Irish parliament; and his mother was a daughter of Thomas Marlay, chief justice of Ireland. Both at school and at Trinity College, Dublin, which he entered in 1763, young Grattan greatly distinguished himself, especially in the study of the classics. While still attending the university he discarded the Tory principles of his father, who, dying in 1766 before his irritation had time to moderate, testified his resentment by depriving him of the paternal mansion, and of all property not secured by settlement. Having inherited, however, a small inalienable patrimony he resolved to study for the bar, and in 1767 he entered the Middle Temple, London. He was called to the Irish bar in 1772, but never ob-

tained a large practice; and indeed from the time that he left the university he seems to have concentrated his attention chiefly on politics and the study of popular oratory. He early acquired a passionate admiration of the great orators of Greece and Rome, and while in London he spent the most of his evenings in the galleries of the House of Commons or at the bar of the Lords, anxious to profit by every opportunity of obtaining an insight into the art of eloquence, his enthusiasm for which had received additional stimulus from the genius of Lord Chatham. The knowledge obtained from the study of the best specimens of ancient and modern oratory, and that gained from witnessing the debates in the English parliament, Grattan began sedulously to apply to the purposes of his own discipline. By the constant practice of recitation to imaginary audiences, and by taking part frequently in private theatricals, he succeeded in overcoming to a remarkable extent his great physical defects, so as to acquire a clear and rounded articulation, an emphasis in some respects admirably consonant with his meaning, and a certain ease in a style of elocution which was effective partly by reason of its very singularity. At the same time, by practicing the habit of writing out the principal passages of his speeches, and submitting them to a constant mental revision, he attained to the possession of a diction which for clearness, epigrammatic vigor, polished beauty of phrase, and the power of illuminating a whole subject by sudden flashes of meaning conveyed in a single sentence, is unsurpassed in modern oratory. He was equally diligent also in perfecting his political knowledge by a careful study of the history and political constitution both of ancient and modern nations; and the minor accomplishment of proficiency as a pistol shot, at that time essential to every Irish politician who would be prepared for all emergencies, was cultivated by him with the same dogged perseverance which he displayed in other matters.

The period at which he began public life was one of the most critical in his country's history; and it is within the limits of strict truth to affirm that he inaugurated a new era in her political condition, and had a greater share than any other individual in determining her present relation to the United Kingdom. Through the writings of Molyneux and Swift, the beginnings of a true national sentiment had been previously awakened; and the first step in the path of constitutional reform had been taken, when by the advocacy of Flood the Octennial Bill of 1768 was passed, which limited the duration of parliament to eight years, instead of as formerly making their continuance depend upon the life of the sovereign; but Flood himself—whose friendship and influence were a powerful element in determining Grattan to adopt a political career—had, like less formidable agitators, succumbed to the intrigues of the "castle," and, although possessed of a private fortune which placed him beyond suspicion of being governed chiefly by mercenary considerations, had consented to hamper his political action by accepting a sinecure office; and it seemed as if the germs of a better future had already begun to rot in a soil of such political corruption.

In February, 1778, Grattan moved an address to the crown, to the effect that the condition of Ireland was no longer endurable, and, although the motion was supported by only a small minority, the discussion bore fruit in the same year by the concession of free export of all produce except woollens, and by the modification of the penal laws to the extent of allowing the Catholics to hold leases for 999 years. In the following year the volunteers by their determined attitude crowned with success his efforts, along with Flood and Burgh, to effect

the total repeal of the restriction Acts, and the same year saw also the repeal of the Test Act. With a view to increase and take advantage of the rising tide of national sentiment, Grattan, on April 19, 1780, moved his famous resolutions that the "king with the consent of the parliament of Ireland was alone competent to enact laws to bind Ireland, and that Great Britain and Ireland were indissolubly united, but only under a common sovereign;" but so satisfied was he with the tone of the debate that, unwilling needlessly to irritate or embarrass the English Government, he did not press his motion to a division. An agitation was, however, begun in the following year against Poyning's Act and the Mutiny Act, and Grattan besides supported the introduction of a bill permitting the Catholics to inherit and hold property on the same terms as other subjects. In order also to bring pressure to bear on the English Government, Grattan, Flood, and Charlemont met privately in the beginning of 1782, and drew up for the consideration of the volunteers' delegates two resolutions in reference to independence; and to these Grattan, on his own responsibility, and without the knowledge of Flood and Charlemont, added a third in favor of the measure for the relaxation of the penal laws against the Catholics. All these resolutions were adopted by the delegates unanimously, and Grattan, strong in armed support, repeated his motion for a declaration of independence, which, although it was lost, aroused such general enthusiasm that, when, on April 16th, he rose to move a Declaration of Rights, he in a brilliant oration congratulated his hearers and his country on the triumphant issue of the struggle, his first words being—"I am now about to address a free people." So completely did his eloquence rise to what was deemed the greatness of the occasion that its effect has seldom been equaled in the annals of oratory; and in the state of high-wrought excitement that prevailed, the government, then doubtful as to the result of the siege of Gibraltar by the French and Spaniards, did not dare to refuse the boon which had already been in reality appropriated without their permission, and on May 17th resolutions were passed unanimously, pledging the English parliament to redress the grievances complained of. In recognition of Grattan's services the Irish parliament was prepared to have voted him a grant of £100,000; but he was with difficulty persuaded to accept half that sum, and only agreed to do so from the consideration that, by relieving him from the necessity of practicing at the bar, it would enable him to devote the whole of his energies to politics. He determined, however, that this gift should not in any way bias his political action, and when Flood, supported by the volunteer convention, brought forward his motion for repeal, he at the expense of his popularity moved its rejection—a procedure which also gave rise to an extraordinary scene of mutual recrimination between the two orators. For the next ten years Grattan carried on the struggle for the reform of Irish abuses with almost no success; and his Place and Pension Bill, and bills to make the great officers of government responsible for their proceedings, to prevent ecclesiastical officers from voting at elections, and to abolish ecclesiastical tithes, were all rejected. At last, in 1793, parliamentary suffrage was conceded to the Catholics as a sop to the United Irishmen; but the concession served only to whet the appetite for further redress, and when the hope of obtaining this, after reaching the verge of certainty by the appointment of Fitzwilliam as lord-lieutenant, was suddenly dashed by his recall, the spirit of brooding discontent increased until ultimately it resulted in the bloody rebellion of 1798. Previous to its occurrence Grattan had withdrawn from parliament. In 1800 Grattan, though in feeble health, entered the Irish parliament as member for Wicklow, specially to oppose

the motion for union, a measure whose bitterness was not rendered less distasteful to him from the time, manner, and means employed for its accomplishment. He regarded its success as almost the nullification of Ireland's partial freedom, and the indefinite postponement of the attempt to remedy her wrongs. Though knowing from the beginning that to contend against the influence of the government was hopeless, he exerted all his eloquence in condemnation of the measure; and his last words in the Irish parliament were: "I will remain anchored here with fidelity to the fortunes of my country, faithful to her freedom, faithful to her fall." In the course of these debates Grattan was three times virulently attacked by Mr. Corry, chancellor of the exchequer, but at last retaliated with overwhelming effect. In the duel which followed Corry was wounded.

After the Union Grattan withdrew for a time from public life, but, in order to lend his assistance to the passing of the Catholic Relief Bill, he in 1805 entered the English parliament as member for Malton; and in the following year he was returned by Dublin, which he had formerly represented in the Irish parliament. Although his speeches in the new arena did not detract from his fame, the union had effected so great a change in his political standpoint that the inspiration which had formerly given to his eloquence such a glow of confident ardor, and had braced his powers to such supreme efforts, was no longer present. He refused to take office in the Fox ministry, but he nevertheless gave the Whigs his support on all important occasions; and by voting with the government on the Irish Insurrection Bill of 1807, he showed that his regard for the general welfare of the empire was unaffected by the great political disappointment of his life. After the rejection of the Catholic Relief Bill of 1813, which was accompanied by a clause reserving to the English sovereign the power of veto in the election of Catholic bishops, the Catholic board repudiated the proposed compromise and declined to intrust Grattan further with their cause. He, however, gave it the same energetic support as formerly, and after 1815 he never spoke in the English parliament on any other subject. In 1819 his motion was defeated by the small majority of two; and on the reassembling of parliament in the following May, he undertook, contrary to the advice of his physician, a journey to London in order again to bring forward the subject, but died a few days after his arrival, June 4, 1820. He received the honor of a public funeral and a grave in Westminster Abbey, where he lies near the tombs of Pitt and Fox.

GRATZ, or GRAZ, the capital of the Austrian crown-land of Styria, is situated in the broad and fertile valley of the Mur, and the beauty of its position has given rise to the punning French description, *La ville des Graces sur la rivière de l'Amour*. Pop (1901), 138,080.

GRAUBÜNDEN. See GRISONS.

GRAUDENZ (Polish *Grudziadz*), a town of Prussia, chief town of a circle in the province of West Prussia, government district of Marienwerder, is situated on the right bank of the Vistula, which is here crossed by a railway bridge, eighteen miles south-southwest of Marienwerder, and forty miles north-northeast of Thorn.

GRAUN, CARL HEINRICH, a celebrated composer, was born May 7, 1701, at Wahrenbrück in Saxony, the youngest of three brothers, all more or less musical. His father held a small post under government, but he gave his children a careful education. Graun's beautiful soprano voice was noticed at the school where he was educated, and soon secured him an appointment in the choir of the city of Dresden. He completed his studies under Schmidt, and profited much by the Italian operas which were performed at Dresden under Lotti, the

celebrated composer. After his voice had changed to a tenor, he made his debut at the opera of Brunswick, in a work by Schurmann, an inferior composer of the day; but not being satisfied with the arias assigned him he re-wrote them, so much to the satisfaction of the court that he was commissioned to write an opera for the next season. This work, *Pollidoro* (1726), and five other operas written for Brunswick, spread his fame all over Germany. Other works, mostly of a sacred character, including two settings of the *Passion*, also belong to the Brunswick period. In the Italian operas he imitates the florid style of his time, but there also considerable dramatic power is occasionally shown in the recitative. Graun died on August 8, 1759, at Berlin, in the same house in which, thirty-two years later, Meyerbeer was born.

GRAVELINES, a fortified seaport town of France, in the department of Nord and arrondissement of Dunkirk, is situated near the mouth of the Aa, eleven miles southwest of Dunkirk. Population about 6,000.

GRAVESEND, a municipal and parliamentary borough, river-port, and market-town in the county of Kent, England, is situated on the right bank of the Thames, opposite Tilbury Fort, thirty miles below London. Population (1901), about 40,000.

GRAVINA, a city of Italy, in the province of Bari, is situated on a hill to the left of the river Gravina, seven miles from Altamura, and thirty-seven southwest of Bari. Population, 16,000.

GRAVINA, GIOVANNI VINCENZO, an Italian litterateur and juriconsult, was born at Roggiano, a small town near Cosenza in Calabria, January 20, 1664. In 1689 he went to Rome, where in 1695 he united with several others of literary tastes in forming the Academy of Arcadians. A schism occurred in the academy in 1711, and Gravina and his followers founded in opposition to it the Academy of Quirina. From Innocent XII. Gravina received the offer of various ecclesiastical honors, but declined them from a disinclination to enter the clerical profession. In 1699 he was appointed to the chair of civil law in the college of La Sapienza, and in 1703 he was transferred to the chair of canon law. He died at Rome January 6, 1718. He was the adoptive father of Metastasio.

GRAVITATION. It is a matter of universal experience all over the earth that a heavy body tends to fall to the ground; and experience shows that, a body dropped from a point above the surface of the earth, always falls in a straight line, which is directed toward the center of the earth.

The familiar instance of the action of a magnet upon a piece of iron will suffice to illustrate what is meant by the word *attraction*. In virtue of certain properties possessed by the iron and the magnet, they are drawn together. The magnet draws the iron, and the iron draws the magnet. This particular kind of attraction is of a very special character. Thus, for example, the magnet appears to have no appreciable influence on a piece of wood or a sheet of paper, and has indeed no considerable influence on any known substance except iron.

By the attraction of gravitation, every body attracts every other body, *whatever be the materials of which each is composed*. In this we see a wide difference between the attractions of gravitation and that form of attraction which is known as magnetic attraction. Nor is the contrast between the *intensities* of these two different attractions less striking. The keeper of a magnet is drawn to the magnet by two different forces of attraction. The first of these is the gravitative attraction, which, so far as we know at present, would be equally exerted, whether the magnetism were present or

not. The second is the magnetic attraction. The latter is enormously greater than the former; in fact, under ordinary circumstances as to intensity and dimensions, the intensity of the attraction of gravitation will not be nearly so much as a millionth part of the magnetic attraction.

The intensity of the attraction of gravitation is indeed so small that, with one conspicuous exception, we can only become aware of its existence by refined and elaborate inquiries. That any two objects—for example, two books lying on the table—do actually attract each other, there can be no doubt whatever; but the intensity of this is so small that the attractive force can not overcome the friction of the table, and consequently we do not find that the books are drawn together. It has, however, been found that the intensity of the attraction of gravitation between two masses is directly proportional to the product of those masses. Hence, though the force is so small as to be almost inappreciable between two bodies of moderate dimensions, yet when the masses of the two bodies, or of even one of them, are enormously great, the intensity of the force will be sufficiently large to be readily discernible. In this way it is that the existence of the attraction of gravitation has been made known to us, and is, in fact, identified with our daily experience—indeed, with our actual existence. The mass of the earth is so enormous that the attraction of gravitation which exists between it and an object near the surface is readily appreciable. It is this attraction of gravitation between the earth and any object which constitutes that force which is referred to when we speak of the *weight* of the body. It is the attraction of gravitation which causes bodies to fall to the surface of the earth; and it is easy to show that the facts already presented with respect to the direction in which a falling body moves are readily explained by the supposition that the motions are due to an attractive influence exerted by the earth, or, to speak more correctly, to a mutual attraction subsisting between the earth and the body.

The time occupied by a body in falling to the surface of the earth, if dropped from a point above it, is independent of the mass of the body as well as of the materials of which the body is composed.

There are, no doubt, certain apparent exceptions to the generality of this statement. The law, as we have stated it, does surely not apply to the case of the balloon or a live bird. In each of these cases the air is made, directly or indirectly, to supply a force which overcomes the force of gravity and neutralizes its effects; but *if there were no air*, then the balloon and the bird would fall to the ground in precisely the same time as a fifty-six pound weight would do when dropped from the same height. It will not be necessary for us to introduce any further reference to the resistance of the air, and we shall discuss the phenomena presented by falling bodies as they would occur in a space from which the air has been removed.

Taking a given interval of time—for example, one second—we see that the height through which a heavy body will fall in one second depends neither upon the mass of the body nor on the materials of which it is composed. This is therefore a constant at any given place on the earth's surface for every description of body, and it is of fundamental importance to determine that quantity accurately. By an indirect method, founded on pendulum observations, it is possible to determine this quantity with far greater accuracy than would be attainable by actually making the experiment. The value as thus found is slightly different at different parts of the earth though constant at each one. It may be taken as 16.1 feet.

When the distance which the falling body moves over in the first second has been ascertained, it is possible to find the distance which will be accomplished in two seconds, or indeed in any number. The difficulty of the question arises from the circumstance that, as the velocity of the falling body is gradually increasing, the distance moved over in the second second is greater than it was in the first, and generally that the distance in any second is greater than the distance accomplished in any previous second.

By suitable contrivances it is possible to ascertain that a body dropped from rest will in a time of two seconds move over a space of 64.4 feet. We have already seen that during the first second the body will fall 16.1 feet. It follows that in the second second the space described by a body falling freely from rest is $64.4 - 16.1 = 48.3$. It is thus obvious that the space described in the second second is three times as great as the space described in the first second. To what is this difference to be ascribed? At the commencement of the first second the body was at rest; at the conclusion of the first second the body had attained a certain velocity, and with this velocity the body commenced its motion during the second second. The total distance of 48.3 feet accomplished during the second second is partly due to the velocity possessed by the body at the commencement, and partly to the action of gravity during that second. By the principle just explained, we are able to discriminate the amounts due to each cause. It appears, from the experiments already referred to, that during the second second as during the first the effect of gravity is simply to make the body 16.1 feet nearer the earth than it could otherwise have been. But the body moves altogether 48.3 feet in the second second, and as the action of gravity during that second will only account for 16.1 feet, it follows that the residue, amounting to $48.3 - 16.1 = 32.2$ feet, must be attributed to the velocity accumulated during the first second.

We are therefore led to the very important result that a body falling freely from rest will have acquired a velocity of 32.2 feet per second when one second has elapsed. It need not be a matter for surprise that, though at the close of the first second the velocity acquired is 32.2, the distance moved over during that second is only 16.1. It will be remembered that the body starts from rest, and that while in the act of falling its velocity is gradually increasing. The body, therefore, moves much further in the last half of the second than it did in the first half, and consequently the total distance traveled must be less than the distance which would have been accomplished had the body been moving during the whole second with the velocity acquired at its termination.

Our earliest knowledge of the law of gravitation is due to the researches of Sir Isaac Newton, who in the summer of 1666 began to investigate the subject. The story that he was led to do so by seeing an apple fall from a tree, rests on the authority of Voltaire. Kepler had proven that the planets revolve in an elliptical orbit around the sun, and Newton conjectured from the tendency of heavy bodies to fall to the earth, that the same cause retained the moon in its orbit round the earth. In 1684 Newton discussed the law of gravity with Sir Christopher Wren, Halley, and Hooke. At first it was supposed that the moon's orbit was a circle, but Newton discovered that it was an ellipse and so informed Halley. There was a dispute afterward as to how much credit Hooke was entitled to for his investigations, but the Royal Society settled that all the honor belonged to Newton.

GRAVITY, SPECIFIC. See HYDROMETER.

GRAY, the chief town of an *arrondissement* in the

department of Haute-Saône, is situated on the declivity of a hill on the left bank of the Saône, thirty-seven miles southwest of Vesoul by rail. Population (1901), about 8,000.

GRAY, DAVID, Scottish poet, was the son of a handloom weaver, and was born at Merkland, about eight miles from Glasgow, January 29, 1838. His most intimate companion was Robert Buchanan, the now well-known poet; and in May, 1860, the two agreed to proceed to London, with the indefinite purpose of finding some kind of employment in connection with literature. Shortly after his arrival in London Gray introduced himself to Mr. Monckton Milnes, now Lord Houghton, with whom he had previously corresponded, who, though unsuccessful in his application for a place for Gray's poem, *The Luggie*, in the *Cornhill Magazine*, gave him some light literary work. He also showed him great attention when a cold which had seized him assumed the serious form of bronchitis, and procured him the means of staying for a time in the south of England; but as the disease made rapid progress, an irresistible longing seized Gray to return to Merkland, where he arrived in January, 1861, and died on December 3rd following, having the day before had the gratification of seeing a printed specimen copy of his poem, *The Luggie*.

GRAY, JOHN EDWARD, a distinguished English naturalist, born at Walsall, Staffordshire, in 1800, was the eldest of the three sons of Mr. S. F. Gray, of that town, druggist and writer on botany, author of the *Supplement to the Pharmacopœia*, etc., and grandson of Mr. S. Gray, who translated for Lee the *Philosophia Botanica* of Linnaeus, and assisted in the composition of the *Introduction to Botany*. He was fifty years keeper of the British museum and died March 7, 1875.

GRAY, THOMAS, the author of the celebrated *Elegy written in a Country Churchyard*, was born in Cornhill, London, December 26, 1716. In the spring of 1739 Gray was invited by Horace Walpole to accompany him as traveling companion in a tour through France and Italy. They made the usual tour, and Gray wrote remarks on all he saw in Florence, Rome, Naples, etc. His observations on arts and antiquities, and his sketches of foreign manners, evince his admirable taste, learning, and discrimination. Since Milton, no such accomplished English traveler had visited those classic shores. In their journey through Dauphiné Gray's attention was strongly arrested by the wild and picturesque site of the Grand Chartreuse, surrounded by its dense forest of beech and fir, its enormous precipices, cliffs, and cascades. He visited it a second time on his return, and in the album of the mountain convent he wrote his famous *Alcaic Ode*. At Reggio the travelers quarreled and parted.

The immediate cause of the rupture is said to have been Walpole's clandestinely opening, reading, and re-sealing a letter addressed to Gray, in which he expected to find a confirmation of his suspicions that Gray had been writing unfavorably of him to some friends in England. A partial reconciliation was effected about three years afterward by the intervention of a lady, and Walpole redeemed his youthful error by a life-long sincere admiration and respect for his friend: From Reggio Gray proceeded to Venice, and thence traveled homeward, attended by a *laquais de voyage*. He arrived in England in September, 1741, having been absent about two years and a half. His father died in November, and it was found that the poet's fortune would not enable him to prosecute the study of the law. He therefore retired to Cambridge, and fixed his residence at the university. There he continued for the remainder of his life, with the exception of about two years spent in Lon-

GREECE



MODERN.



don, when the treasures of the British Museum were thrown open. At Cambridge he had the range of noble libraries. In 1742 Gray composed his *Ode to Spring*, his *Ode on a Distant Prospect of Eton College*, and his *Ode to Adversity*,—productions which most readers of poetry can repeat from memory. He commenced a didactic poem, *On the Alliance of Education and Government*, but wrote only about a hundred lines. Every reader must regret that this philosophical poem is but a fragment. It is in the style and measure of Dryden, of whom Gray was an ardent admirer and close student. His *Elegy written in a Country Churchyard* was completed and published in 1751.

Gray died July 30, 1771, and was buried, according to his own desire, beside the remains of his mother at Stoke Pogis, near Slough in Buckinghamshire, in a beautiful sequestered village churchyard that is supposed to have furnished the scene of his elegy.

GRAYLING (*Thymallus*) are fishes belonging to the family of *Salmonidae*, which resembles the vendace and gwyniad in having scales of considerable size, and a narrow mouth with very small teeth. They are distinguished by their large, wing-like, dorsal fin. Only a few species are known, which inhabit clear streams of the north of Europe, Asia and North America.

GRAZALEMA, a town of Spain, in the province of Caçiz, is situated on the great road from Cadiz to Ronda, sixty miles east-northeast of Cadiz. Pop. 7,000.

GRAZZINI, ANTONFRANCESCO, an Italian author, was born at Florence, March 22, 1503. Of his youth and education all record appears to be lost, but he probably began early to practice as an apothecary. In 1540 he was one of the founders of the Academy of the Humid (degli Umidi), and about forty-two years afterward he took a prominent part in the formal establishment of the more famous Accademia della Crusca. He died in 1583.

GREAT BRITAIN AND IRELAND, THE UNITED KINGDOM OF. See ENGLAND.

GREAT EASTERN, the largest ship ever built, was constructed on the Isle of Dogs, Eng., in 1853-56. Its dimensions were: Length, 692 feet; breadth, 118 feet; height, 70 feet. She had eight engines, with a capacity of 11,000 horse power; ten boilers, five funnels or chimneys, and six masts. The weight of the ship was estimated at 12,000 tons. She was utilized in laying the first Atlantic cable, but did not prove to be a profitable investment, and was broken up for junk in 1889.

GREAT FALLS, the capital of Cascade county, Montana, is situated on the Great Falls of the Missouri river. The water power available for manufacturing purposes is large, and the transportation facilities are complete and efficient. The city contains two smelting works, two lumber mills, an iron foundry and some manufactures of minor importance, four banks, two schools, four churches, one daily and one semi-weekly paper, police and fire departments, good water supply and sewers. Population, (1900), 14,030.

GREAT FALLS, a town in Strafford county, N. H., stands on the Salmon river and has extensive railroad connections. There is abundant water-power, which is used by woolen and cotton factories. The town has two newspapers, national and savings banks, and telegraph facilities.

GREAVES, JOHN, a mathematician and antiquary, was born in 1602. He was educated at Balliol College, Oxford, and in 1630 was chosen professor of geometry in Gresham College, London. After traveling in Europe, he in 1637, visited the East, where he collected a considerable number of Arabic, Persian, and Greek manuscripts, and made a more accurate survey of the

pyramids of Egypt than any traveler who had preceded him. He died in 1652, leaving a number of important works on science.

GREBE, the generally accepted name for all the birds of the family *Podicipedidae*, belonging to the group *Pygopodes* of Illiger, members of which inhabit almost all parts of the world. Some systematic writers have distributed them into several so-called genera, but, with one exception, these seem to be insufficiently defined. Grebes are at once distinguishable from all other water-birds by their very short body, and the peculiar structure of their feet, which are not only placed far behind, but have the tarsi flattened and elongated toes furnished with broad lobes of skin.

GRECO, EL. Domenico Theotocopuli, commonly called El Greco, was a native of Greece, where he was born about the year 1545. He appears to have studied art at Venice, where it is alleged that Titian was his master. The date of his removal to Spain is unknown; but in 1577 we find him at Toledo, engaged on one of his most admired paintings, that on the parting of the raiment of Jesus. In 1579, having been summoned, along with other artists of repute, by Philip II. to contribute to the decoration of the Escorial, he began to aim at greater originality of style with very unfortunate results. The first work in his new manner, having for its subject the martyrdom of St. Maurice, was executed in 1579; in this, as in all his subsequent productions, a dull ashen monotony of color combines with stiff and unnatural drawing to produce an effect which is at no time very pleasant, and is sometimes absolutely repulsive. He practiced sculpture and architecture as well as painting, and is said by Panheco to have written with great learning and ability upon all these arts; none of his books, however, have come down to our time. He died at Toledo in 1625.

GREECE is a European kingdom, occupying the southern portion of the most easterly of the three peninsulas which Europe projects into the Mediterranean. By its own inhabitants it is called Hellas, as it was also in antiquity, and the name Greece, by which in one form or other it is known in most European languages, was given to it by the Romans, and was not used by any Greek writer, so far as we know, before Aristotle. Why the Romans called it so is an obscure point, but the most probable and usually accepted explanation is that they gained their first knowledge of the country from a tribe in the northwest of Greece who were called Græci, and that they accordingly gave the name of that tribe to the whole country. The name Greece or Hellas has been applied at different times to territory of widely different extent. At first Hellas denoted nothing but the spot in Thessaly where the tribe of Hellenes dwelt, and in later times, after Philip of Macedon obtained a seat at the Amphictyonic council, it meant the whole peninsula south of the Balkan mountains (Hæmus) including Macedonia and Thrace; but at the period of its greatest distinction it excluded these two regions, and was restricted to the part of the peninsula to the south of the Cambunian range and the islands of the surrounding seas. Its ancient limits, however, cannot be rigidly defined, for (1) its northern frontier seems never to have been precisely settled, some writers excluding Thessaly which was generally taken in, and others including part of Epirus which was generally left out; and (2) the name Hellas expressed not so much a geographical as an ethnological unity. It was the country of the Hellenes. Wherever Greeks settled there was Hellas, and a Greek colony in Sicily or Africa was thought to participate as essentially in all that constituted Hellas as either Attica or Lacedæmon. Still the name was usually applied to

the land which formed the geographical center of the race, of which the greatest length was 250 miles and the greatest breadth 180, and which had an area, exclusive of Epirus (4,690 square miles), but including Eubœa (1,410 square miles), of 21,121 square miles. This territory comprised (1) Northern Greece, all north of the Maliac (Zeitoun) and Ambracian (Arta) Gulfs; (2) Central Greece, extending from these gulfs to the isthmus of Corinth; (3) the peninsula of the Peloponnesus (Morea) to the south of the isthmus; (4) the following islands,—Eubœa (Negropont) in the east, the Ionian Islands in the Ionian Sea on the west, Crete and Cyprus in the south, and the Cyclades and Sporades across the mouth of the Ægean from the southeast headlands of Attica and Eubœa. Continental Greece—*i.e.*, all the country now specified, exclusive of the islands—consists of a series of natural cantons, hedged from one another and from the outer world by mountain ranges from 5,000 to 8,000 feet high, and so was almost by a physical necessity occupied in the times of its ancient political independence by seventeen separate states. These states, which are noticed separately under the special headings, were: Thessaly in North Greece; Acarnania, Ætolia, Locris, Doris, Phocis, Megaris, Bœotia, and Attica in Central Greece; and Corinthia, Sicyonia, Achaia, Elis, Messenia, Laconia, Argolis, and Arcadia in the Peloponnesus.

Modern Greece is of smaller extent, and its limits are strictly determined by the arrangement between Great Britain, France, Russia, and Turkey, concluded at Constantinople on July 21 [oth], 1832, which finally settled the question of frontier between Greece and Turkey. It left to Turkey the fertile Greek-speaking province of Thessaly and part of Acarnania, and fixed the northern boundary of Greece at a line running from the Gulf of Arta (Sinus Ambracius) to the Gulf of Volo (S. Pagasæus), keeping along the crest of the Othrys mountain range. The pass of Khlomo was to belong entirely to Greece, and the fort of Punta (Actium) at the southern head of the Gulf of Arta was to continue to belong to Turkey, though Greek vessels were required to have free entry into the gulf. The Ionian islands, consisting of Corfu (Corcyra), Paxo (Paxos), Santa Maura (Leucas), Cephalonia, Thiaké (Ithaca), and Zante (Zacynthus) on the west coast of Greece, and Cerigo (Cythera) on the south, which had remained under British protectorate for fifty years, were voluntarily ceded by Britain to Greece in 1864, after the accession of king George. Modern Greece is 200 miles long from north to south, and 180 broad from east to west, and has an entire area of 24,977 square miles.

Its most obvious geographical peculiarity is its remarkable richness in mountains, bays, and islands, which give it unexampled natural defenses, unusual maritime facilities, and quite a peculiar variety of climate, vegetation, and scenery. In this respect it but gathers into a smaller page and expresses in distincter type the structural peculiarities of the continent to which it belongs. In the complexity of its make and the variety of its natural features Greece excels every country of Europe, as Europe excels every continent of the world. No part of Greece is forty miles from the sea or ten from the hills. Though not much more than half the size of Portugal, it has a coast-line greater than that of Spain and Portugal together, and that coast-line is broken everywhere into all manner of gulfs, and bays, and inlets, affording a rich supply of good natural harbors. The country is divided by its mountain chains into a number of independent parts, the capture of one of which by an enemy is but a single step toward possession of the whole. The small basins of arable land between these hills maintained comparatively isolated popula-

tions, on account of the difficulty of inland intercommunication, and naturally developed that individuality of character, that local patriotism, and that political independence, which marked the ancient Greek communities. And the great variety of pursuit, interest, and stimulus which the geographical features of the country created could not fail to conduce to the uncommon mental vigor, quickness, and versatility which the people exhibited. The Greeks, therefore, owed their greatness largely to the country it was their fortune to dwell in.

The modern Greeks are of very composite origin, yet are an extremely compact and homogeneous people. Out of more than two million, which constitute the present population of the country, only about 85,000 speak any other language than Greek, and only 20,000 profess any other religion than the Orthodox; and all draw well together, glorying with one another in the same memories of a common deliverance, and sharing in the same ambition of a great future. There are in the narrow bounds of Greece three distinct races, speaking different languages, wearing different costumes, observing different customs, and holding little social intercourse with one another. These races are the Greek, the Albanian, and the Wallachian. All three are probably much mixed in blood, and, in fact, the descent of each of them has been a very vexed problem in ethnology. But, on the whole, the suggestion of Freeman seems the most likely account of the matter—that, taking them all in all, these three races are the direct representatives of the three races which occupied Greek territory at the time of its conquest by the Romans. Since that time their blood has certainly been mingled with other elements, but still substantially the base of the modern Greek is the ancient Greek, the base of the modern Albanian is the ancient Illyrian, and the base of the modern Wallachian is the ancient Thracian.

Of these races the least numerous in Greece is the Wallachian or Roumanian. They are found chiefly in the mountainous regions in the northern parts of Greece, on the slopes of Othrys, in the neighborhood of Zeitoun, on the hills of Acarnania and Ætolia, and even so far south as the banks of the Bœotian Cephissus. They pursue a nomadic shepherd life, wear black shaggy *capotes* made to imitate sheep-skin, and speak Roumanian—a modified Latin—the language of their race, and also Greek, the language of the country. They belong to the Greek Church, and sometimes marry Greek girls, but almost never give their own daughters in marriage to Greeks.

The rest of the population, comprising the great bulk of it, are Greeks,—a people speaking the Greek language, practicing the Greek rite, and claiming descent from the ancient Greek race. This claim, which seems to rest naturally on the obvious evidence of language and feature, was warmly contested on historical grounds by Fallmerayer, who held that during the Slavonic occupation of the country the ancient Greeks were completely extirpated, and that the present inhabitants are merely Slavonians Byzantinized. But his arguments have been conclusively confuted by Hopf, Finlay, and others, and it may be said to be now universally admitted that, while the blood of the population contains a considerable Slav admixture, its base is still that of the ancient race of Hellas.

The national character of the Greeks is a matter upon which authorities take very contrary views, some idealizing them foolishly, and others depreciating them most unjustly. They seem to have the faults and the excellences of their famous ancestors. They have their quickness of parts and their moderation of character. They are inquisitive, full of mental activity, fond of

excitement, as keen for discussion as in the days of Plato, and as eager after novelty as in those of Paul. Their thirst for knowledge is indeed quite remarkable, as well as their aptness to learn. Boys will put themselves to any discomfort in order to get to school; students at the university never missed a day from their classes during the Revolution of 1863, but regularly attended the lectures with the arms of the national guard in their hands; and domestic servants are often found in spare hours learning their letters or doing their sums. They excel in fact, in astuteness, in — what Tuckerman calls the most distinctive thing about them — *finesse*, which degenerates often into cunning, the weapon of the weak, which could not fail to be forged under their long Turkish oppression. They are courteous and very sunny in disposition, and entirely strangers to melancholy, so that both suicide and insanity are unknown among them. They are the most temperate of Christian nations, and the chastest. Though they make a good deal of strong wine, they drink little, and they eat as sparingly as they drink. The common people live on one meal a day, and the richer on two. A little maize and vegetables steeped in oil make the staple fare. Their rate of illegitimacy is lower than that of any other European country, which may perhaps be ascribed to the fact that Greece is the only country in Europe where the males outnumber the females, and that this circumstance combines with the frugal habits of living of the people to encourage early marriages. In other countries from 3 to 22 per cent. of the births are illegitimate, in Greece only 1.40 per cent. are so. Two striking characteristics of the Greeks are their patriotism, — their local attachment to their country, which stands out in the stronger relief because it is a quality in which their neighbors the Turks are entirely wanting — and their love not only of liberty but specially of equality. They are in spirit the most democratic European nation. They have no nobility — as of old, to be a Greek is itself to be noble; and Mahaffy says that "every common mule-boy is a gentleman and fully your equal, sitting in the room at meals, and joining in the conversation at dinner;" and such is their jealousy of social superiorities that he was often told by Greeks that the only reason why they tolerated a foreign king was that they could not endure to be under one of themselves. It is the same temper as ostracized Aristides, and doubtless its springs largely from their vanity and egotism, which even the most favorable witnesses own to be among their prominent faults. They have a deep belief, which they take no pains to conceal, in their own superiority over other nations; and the point in which they conceive their superiority more especially to dwell is in their intellectual gifts.

The population of Greece was in 1896, 2,433,806. The islands are the most densely peopled portions of the kingdom, especially the Ionian Islands, which have a population of 231,174, or 229 to the square mile. In continental Greece the rate is only 59 per square mile, and in the Morea 89. Greece is more thickly peopled than any country of Europe, except Russia and Sweden. The capital, Athens, had a population in 1896 of 111,486.

The kingdom of Greece is an hereditary constitutional monarchy, descending by primogeniture from male to male, female succession being only allowed in the event of the absolute failure of legitimate heirs male. The title of the sovereign at first (according to the convention of London, May, 1832) was king of Greece, but it was altered by the conference of London, August, 1863, to king of the Hellenes. The king attains his majority at eighteen years of age. Both he and the heir-apparent are required to belong to the Greek orthodox church, but a special exception is made for the present king,

who is a Lutheran. The king receives an annual income of £52,179, of which £40,179 comes from the civil list, and £12,000 from personal donations of £4,000 from each of the three protecting powers. He has a palace in Athens — built by Otho at a cost of £500,000 — and a summer residence at Corfu. The legislative power is shared by the king with a single chamber called the *boule*, — a house of representatives which is elected for four years by the people; its numbers cannot fall below one hundred and fifty.

For purposes of local government Greece is divided into sixteen nomarchies, under officers called nomarchs, whose duties correspond with those of the French prefects; the nomarchies are subdivided into eparchies, under eparchs, corresponding to French sub-prefects, and the eparchies are further subdivided into demarchies, under demarchs, or mayors. The demarchs are elected by the people for four years; the nomarchs and eparchs are elected by the government without fixed terms. The nomarchs are assisted in the administration of the province by a council elected by universal secret suffrage for four years, which manages the police, roads, and other local business, and imposes the assessments. The local accounts must be sent once a year to Athens, to be audited by a court of government officials.

Greece has an admirable legal system, which is the one good thing it has got from the Bavarians. It is based on the old Roman law, with modifications drawn from the Bavarian and French. Liberty of person and domicile is inviolate; no one can be apprehended, no house can be entered, and no letter can be opened, without a judicial warrant. Criminal and political offenses and delinquencies of the press are tried by jury. The commercial code is identical with that of France.

Crime is proportionately less common in Greece than elsewhere, for the people are more temperate, and, on the whole, more contented. The peculiar Greek crime is — or, as we may happily now say, was — brigandage, the form of robbery which is natural to a mountainous and thinly peopled country without roads. According to the latest consular reports, the country is at present completely free from brigands. But it will never be secure against their reappearance until it obtains good roads, which will operate against the brigands both by tending to increase the rural population and by affording better facilities for the capture of criminals.

The strength of the Greek army on a peace footing in 1901 was 21,079 men. The navy consists of two small ironclads, some gunboats and twenty-three torpedo-boats, which are manned by 3,782 men, raised, as a rule, by conscription, from the inhabitants of the coast, though volunteering is encouraged. The Greek flag is a white cross on blue ground — the Bavarian colors and the Greek cross.

The religion of the people and of the state is that of the Orthodox Greek Church. In fact, the Greek rite is not only the national religion, but perhaps the deepest and most creative factor in the nationality of Greece itself. Men of Greek blood who do not belong to the Greek Church do not identify themselves with the Greek people. The Moslems of Crete were the sternest oppressors the Greeks knew, and the Latins of Syros sided at the revolution with the Turks, yet both were of the purest Greek descent. And what makes the Greek and Skipetar and Wallach of the modern kingdom all equally Greek in their sympathies to-day is their common profession of the Greek rite. But all other religions are tolerated in Greece.

Popular education is widely diffused in Greece. It was the first care of the newly-liberated people, and has been jealously fostered ever since, till they have now an exceedingly complete national system of education.

which is perhaps the most striking product of the new kingdom.

Agriculture is still in its infancy. A larger proportion of its area is uncultivated than obtains in any country in Europe except Russia; but that is explained by the unusually large part of it which is occupied by mountains. We have no exact statistics since 1893, when 3,542,000 acres were under cultivation. Its entire area (exclusive of the Ionian Islands, not then part of it), was 45,699,248 stremmas—a stremma being a little over a quarter of an acre. Of these only 17,824,000 were capable of cultivation, and only 6,076,000 actually under it, and half of this amount is always fallow from their system of working it. There were in 1900, 603 miles of railway in operation.

The soil is, as a rule, light and thin. In many places there is great lack of rain and running water, but the people are expert in irrigation. The chief products are corn, wine, fruit and oil. Six different kinds of wheat are grown, producing, in a favorable season, as much as ten or thirteen returns, and after a dry spring from three to five. Good crops are got of rye, barley and maize; oats do not grow so well, and potatoes not at all. Pulse thrives everywhere, and rice is produced in the plains of Marathon and Argos, and in marshy land elsewhere. Cotton and tobacco have been introduced in our day, and give good returns.

Greece is still in want of one of the first requisites to agricultural prosperity—a resident proprietary. The modern kingdom began with almost no proprietors. Under the Turks two thirds of the land belonged to the sultan, and became at the revolution simply national property, which the government has been selling ever since to private owners on more or less reasonable terms. The peasants are showing a passion for land, and save up to buy their crops, and in this way a large class of small freeholders is being created, with what effect upon agriculture we have no means of yet determining.

The methods of cultivation in use are still primitive. Modern implements are not employed to any great extent, though their manufacture is carried on at Syra and the Piræus, and though even the steam plow has been actually introduced in Elis. The Greek plow is still that of Homer, which the husbandman carries about his croft on his shoulder, and which hardly does more than scrape the surface of the ground.

The early history of Greece is the first chapter in the political and intellectual life of Europe. In contrast with nations still in the tribal stage the Greeks have already the life of cities; in contrast with the despotic monarchies of the East they recognize the principle that no personal rule should be unlimited. From the first they appear as a people obedient to reason and to a native instinct of measure. In the political sphere this leads them to aim at a due balance of powers and tendencies in the state, at the definition of duties and the protection of rights. In the intellectual sphere it leads them to explore causes, to interpret thought in clear forms, to find graceful expression for the social feelings and sympathies. The historical interest of Greece does not begin therefore only at the point where details and dates become approximately certain, but with the first glimpses of that ordered life out of which the civilization of Europe arose. At a later stage the Greek commonwealths offer the most instructive study which the ancient world affords in the working of oligarchic and democratic institutions. Then, as the Roman power rises, culminates, and declines, Greek history assumes a new character and a new interest. From Alexander the Great dates the beginning of a modern Greek nation, one, not in blood, but in speech

and manners. Two main threads link together the earlier and later history of civilized man. One passes through Rome, and is Latin; the other passes through the new Rome in the east, and is Greek.

Six periods may be distinguished. I. The prehistoric period, down to the close of the great migrations. II. The early history of the leading states down to about 500 B.C. III. The Ionic revolt and the Persian wars, 502-479. IV. The period of Athenian supremacy, 478-431. V. The Peloponnesian War, 431-404, followed by the period of Spartan and then of Theban ascendancy, 404-362. VI. The reigns of Philip and Alexander, 359-323 B.C.

We first know the Hellenes as a race divided into two great branches, each with well-marked characteristics of its own,—*Dorians* and *Ionians*; while those who have been less affected by the special causes which produced these divergences from an earlier common type are regarded as forming a third branch, and are called collectively *Æolians*. Further, we hear of a people distinguished indeed from the Hellenes, yet apparently felt (as by Thucydides) to be not wholly alien from them.—a people represented as having been before them in Greece proper, on the coasts, and in the islands of the Ægean,—the *Pelasgians*.

The highlands of Phrygia have the best claim to be regarded as the point of departure for the distinctively Hellenic migrations. In these fertile regions of north-western Asia Minor, the Hellenes, after the Italians had left them, may have lived, first as a part of the Phrygian nation, and afterward as a separate people. From these seats a great wave of migration seems to have carried over the Hellespont into Europe a population which diffused itself through Greece and the Peloponnesus, as well as over the coasts and islands of the archipelago. In after ages, when the kinship, though perhaps dimly suspected, was no longer recognized, the Hellenes called these earlier occupants of the land *Pelasgians*.

The second epoch of migration from the Phrygian highlands appears to have been one by which single Hellenic tribes, with special gifts and qualities, were carried forth to become the quickeners of historic life among inert masses of population, among those "Pelasgians" who had long been content to follow the calm routine of husbandmen or herdsmen. The ancestors of the Ionians went down to the coasts of Asia Minor, and became the founders of a race whose distinctive powers found scope in maritime enterprise and in commerce. The ancestors of the Dorians passed into the highlands of Northern Greece, and there developed the type of hardy mountaineer which united the robust vigor of hunter and warrior with a firm loyalty to ancestral traditions in religion and in civil government.

Of these two branches,—the Ionian and the Dorian,—the Ionian was that which most actively influenced the early development of Greece.

Two periods of Phœnician influence on early Greece may be distinguished: first, a period during which they were brought into intercourse with the Greeks merely by traffic in occasional voyages; secondly, a period of Phœnician trading settlements in the islands or on the coasts of the Greek seas, when their influence became more penetrating and thorough. It was probably early in this second period—perhaps about the end of the ninth century B.C.,—that the Phœnician alphabet became diffused through Greece. This alphabet was itself derived from the alphabet of the Egyptian hieroglyphics, which was brought into Phœnicia by the Phœnician settlers in the Delta. The direct Phœnician influence on Greece lasted to about 600 B.C. Commerce and naviga-

tion were the provinces in which the Phœnician influence, strictly so called, was most felt by the Greeks. In art and science, in everything that concerned the higher culture, the Phœnicians seem to have been little more than carriers from East to West of Egyptian, Assyrian or Babylonian ideas.

The legends of European Greece speak clearly of foreign elements in civilization and in religious worship which came in from the East. But they do not constrain us to suppose that those who brought in these new elements were always, or as a rule, strangers to the people among whom they brought them. On the contrary the myths constantly say, or imply, that the new comers were akin to the people among whom they came; as the sons of Ægyptus are first cousins to the daughters of Danaus; as Cadmus and Pelops, though nominally of foreign origin, are thoroughly national heroes and founders. Hence it appears reasonable to conclude that the East by which European Hellas was most directly and vitally influenced was not the Semitic but the Hellenic East; that the Ionian Greeks of Asia Minor, after having themselves been in intercourse with Phœnicia and Egypt, were the chief agents in diffusing the new ideas among their kinsmen on the western side of the Ægean. Asiatic Greeks, who had settled among Egyptians in the Delta, or who had lived amid Phœnician colonies in Asia Minor, would easily be confounded, in popular rumor, with Egyptians or Phœnicians.

The appearance of new elements in religious worship is one great mark of the period during which Greece in Europe was still being changed by influences, Greek or foreign, from the East. The worship which the fathers of the Hellenes had brought with them from the common home in Asia was the worship of the "Heaven-father," the unseen father who dwells in æther, whose temple is the sky, and whose altar is most fitly raised on the mountain top, as the ancient shrine of the Arcadian Zeus was the grove on the summit of Mount Lycæus. This is the "Pelægian Zeus, dwelling afar," to whom the Homeric Achilles prays. But as the united Hellenic race parted into tribes, so to the first simple worship of the Heaven-father was added a variety of local cults. And as mariners from other lands began to visit the coasts, they brought in their own gods with them. Thus Melcarth, the city-god of Tyre, is recognized in Melicertes as worshipped at the isthmus of Corinth. In one Greek form of the worship of Heracles, Astarte—the goddess of the Phœnician sailors—becomes Aphrodite, who springs from the sea. The myth of Adonis, the worship of the Achæan Demeter, are other examples.

Little precise knowledge of the earliest kingdoms and states can be extracted from the legends as they have come down to us, but some general inferences are warranted. The tradition that Minos cleared the archipelago of pirates and established a wide maritime dominion, that he was the first to sacrifice to the Charites, and that Dædalus wrought for him, may be taken at least as indicating that Crete played a prominent part in the early history of Greek culture, and that there was a time when Cretan kings were strong enough to protect commerce in the Ægean waters. Again, though Gordius and Midas have passed into the region of fable, there are reasonable grounds for the belief that the ancient kings of Phrygia once exercised dominion over Asia Minor. The Lydians, in whose origin Semitic and Aryan elements appear to have been mingled, have a twofold interest in this dawn of Hellenic history. First, they represent the earliest kingdom in Asia Minor of which anything is certainly known. Secondly, they are on land what the Phœnicians are on the sea, carriers or mediators between the Greeks and the East.

In the northwest corner of Asia Minor, a branch of Dardani—whose ancestor is described as worshipping the Pelægian Zeus—founded the kingdom of the Troas, the land of Troy. It has been remarked that the double names of the Trojan heroes, Alexander, Paris, Hector, Darius, point to the twofold relationship of the Trojans, on the one side to Hellas, on the other to Asia. In European Greece we find the race known as the Minyæ, whose early glories are linked with the story of "Jason and the Argonauts" moving southward from the shores of the Gulf of Pagasæ into the valley of Lake Copais, and founding the Bœothian Orchomenus. The early greatness of Thebes is associated with the name of Cadmus, the king-priest who introduces the art of writing, who builds the citadel, who founds a system of artificial irrigation. The Achæan princes, whose chivalrous spirit is expressed in the Homeric Achilles, rule in the fertile valley of the Thessalian Phthiotis. In the Peloponnesus the Pelopidæ at Mycenæ reign over Achæans; and Agamemnon is said to rule, not only "all Argos," but "many islands."

We now come to a phase in the development of early Greece which tradition represents as following, but at no great interval, the age in which a Pelopid dynasty ruled at Mycenæ and fought against Troy. This is the period of great displacements of population within the mainland of European Greece. The first of these migrations is that of the people afterward known as Thessalians. The legend placed these events about 1124 B. C., or sixty years after the fall of Troy. About twenty years later in the mythical chronology occurs the third and more famous migration, known as the return of the Heraclidæ. The Achæans, driven from their old seats in the south, moved northward; and, reinforced by Æolic kinsmen from Bœotia and Thessaly, established themselves on the northwest coast of Asia Minor, where Lesbos and Cyme became their strongholds. By degrees their dominion spread inland, until they had become masters of Mysia and the Troad. The Æolic migration which thus created an Asiatic Æolis was unquestionably the slow work of generations. The immediate cause of the Ionic migration, which began later than the Æolic, appears to have been the overcrowding of Attica by the Ionians driven out of Achaia. The Æolic settlements had been the work of a people migrating in large masses. The Ionic colonization seems to have been effected rather by smaller numbers of warlike adventurers, sprung from the noble Ionian families of Attica and the Peloponnesus, who claimed to rule over the Ionic communities already established on the Asiatic coast. The Dorian colonists, following the southward direction of their previous conquests, settled on the southwest coast of Asia Minor. The Islands of Cos and Rhodes received Dorian settlers; and, after what was probably a long struggle, the Dorians subdued Crete.

While the populations had thus been settling down into the places which they were to occupy during the historical age of Greece, a movement had been in progress on the European mainland which tended to quicken among the various tribes a sense of the unity of the race. This was the establishment of local associations among neighboring tribes for the common worship of the same god. These associations were of a federal character: that is, while the members of the association were independent in other matters, they were subject to a common central authority in all that concerned religious worship. Such a federal association was called an *amphictyony*, that is, a *league of neighbors*. The most important of such leagues was the Delphic amphictyony, of which the object was to conserve the worship of Apollo at Delphi.

The Homeric poems may be regarded by the student of history as great pictures of political and social life, illustrating the whole variety of Greek experience down to the close of that age which saw the tides of Æolic, Ionic, and Doric migration flow from the west to the east of the Ægean. It is a distinct question how far recoverable historical fact is embedded in their text, or how far trustworthy inferences may be drawn from them in regard to a supposed series of events.

In the history of the Peloponnesus after the Dorian immigration we begin to be on firmer ground. There may still be large room for doubt as to particular dates or names, but the age left permanent records in the institution which survived it. The first thing which should be borne in mind with regard to the Dorian immigration is that its direct influence was confined to three districts of the Peloponnesus. Argolis, Laconia, and Messenia were thoroughly Dorianized. Of the other three districts, Arcadia remained almost wholly unaffected, Elis and Achaia were affected only indirectly, through the influx of the populations which the Dorians had displaced. The first rank in the Peloponnesus was long retained by Argos. Sparta was at first only one member of a Laconian hexapolis. It was at a later stage that Sparta became the head-town of the country, and the seat of a central government. The origin of the dual kingship may probably be traced to this period. Such dualism has no parallel elsewhere among Dorians; and, as regards one at least of the two royal lines, we know that the Agiade Cleomenes proclaimed himself an Achæan. The two royal lines of the Agiade and Eurypontide may have taken their beginning from a coalition or compromise between Dorian and Achæan houses. Afterward, when it was desired to explain the dualism and to refer both lines to a common source, Agis and Eurypyon were represented as descended from the twin sons of Aristodemus, Eurystheus and Procles.

The spread of Spartan power in the Peloponnesus was preceded by the building up of that political and social system which made the Spartan citizens a compact aristocracy, exclusively devoted to the exercises of war. The personality of Lycurgus is shadowy. He has even been classed with those beings who, like Prometheus, Hermes, and Phoroneus, bestow on men that gift of fire without which they could not have attained to a high civilization. It is another question whether he was the author of all the institutions which were afterward ascribed to him. The example of another legislator who stands in a far clearer light of history—the Athenian Solon—whom the orators sometimes credit with the work of Clisthenes in addition to his own, may serve to show how loose such ascriptions often were. But at least the work of Lycurgus may be assumed to have marked an epoch in the history of the Spartan system.

The *Helots* cultivated the lands of the Spartans, not as slaves belonging to private masters, but as serfs of the commonwealth; hence no Spartan citizen could sell a *Helot* or remove him from the land. From each farm the *Helots* had to produce annually a certain quantity of barley, oil, and wine; if there was a surplus, they could keep it for themselves. The condition of the *Helots* was thus in some respects better than that of ordinary Greek slaves. But it was such as constantly to remind them that they had once been a free peasantry. It was this, as much perhaps as positive ill-usage, which made it so peculiarly galling. The hatred of the *Helots* was a standing menace to the Spartan commonwealth. As Aristotle says, the Spartan kingship meant practically a life tenure of the chief military command. The government was essentially an official oligarchy,

in which the power of the irresponsible *ephors* was not importantly modified by the *gerousia*, while the popular assembly played a part hardly more active than that of the Homeric agora, with its formal privilege of simple affirmation or veto. The military training, from childhood upward, to which the whole social life of Sparta was made subservient, was at first a necessity; but it soon became thoroughly identified with the ambition and with the pride of an exclusive warrior-caste. Sparta was sharply marked off from the other Greek communities by this systematic treatment of war as the business of life. When the military prestige of Sparta began to decline in the course of the fourth century B.C., it was remarked that this was due to the increased attention which other states had begun to pay to the art of war, whereas in old days the Spartans had been like professional soldiers matched against civilians.

Myths have grown thickly around the story of the two Messenian wars. This, at least, appears certain: the gradual conquest of Messenia by Sparta occupied not less than a hundred years, (about 750-650 B.C.) Sparta was helped by Elis and Corinth. When Messenia had been conquered and the Dorian inhabitants reduced to the state of *Helots*, Sparta had overcome the most difficult obstacle to her ambition. By conquests, of which the details are obscure, she won from Argolis a strip of territory on the eastern coast of the Peloponnesus, and finally carried her northeastern border to Thyrea. In southern Arcadia alone the Spartan arms were decisively repulsed by Tegea; and the Tegeans, accepting the supremacy of Sparta, were enrolled, about 560 B.C., as honored allies of the power which they had checked.

The repulse warned Sparta that it was better to aim at leading the Peloponnesus than at conquering it; and an opportunity was found of asserting this leadership in a manner far more effective than any military demonstration. At Olympia, in the valley through which the *Alpheus* passes to the western coast, there was an ancient sanctuary of the Pelasgian Zeus. An *amphictyony*, or league of neighboring towns, held sacrifice and games there once in four years, the management of the festival being shared between Pisa and Elis. A dispute arose between these two states. Sparta confirmed Elis in the religious superintendence of the festival, and at the same time arrogated to herself the political headship of the sacred league. Every effort was now made by the Spartans to extend the popularity and enhance the brilliancy of the Olympic games. Sparta—already supreme in Laconia and Messenia, already the victorious rival of Argos in the east of the land—now appears at the Olympian shrine of Zeus in a character peculiarly well adapted to attract the loyalty of the western Achæans. The general recognition of Sparta as the first state in the Peloponnesus may be said to date from the time when, under Spartan auspices, the Olympic festival acquired a new celebrity.

The age of the oligarchies and tyrannies coincides with the most active period of Greek colonization, which received an impulse both from redundant population and from political troubles at home. The two centuries from 750 to 550 B.C. saw most of the Greek colonies founded. Sicily received settlements from both the two great branches of the Greek race. Naxos, founded by the Chalcidians of Eubœa (735 B.C.), with Leontini and Catana, founded soon afterward by Naxos, formed a group of Ionic communities on the eastern side of the island. Syracuse, founded by Corinth (734 B.C.); Gela, colonized by Rhodians and Cretans (690 B.C.), and Agrigentum, of which Gela was the parent city (582 B.C.), were among the chief of the Dorian commonwealths on the southeastern and southwestern coasts.

These Siceliot cities formed a fringe round the Siceli and Sicani of the interior; but, though in the presence of non-Hellenic populations, they never lost among themselves the sharp distinction between Dorian and Ionian (or "Chalcidic"), a distinction which was long the key-note to the inner history of the Siceliots. The earliest of the Greek settlements in Italy was the Ionic Cumæ, on the coast near Cape Misenum, a little to the northwest of Naples. It was founded by Chalcidians of Eubœa, as early, according to the tradition, as 1050 B.C. The Dorian Tarentum—a colony of Sparta—and the Achæan (Æolic) settlements of Sybaris and Croton, dated from the latter part of the eighth century B.C. Poseidonia (Pastum) was founded by Sybaris. Locri, an Æolic settlement near Cape Zephyrium, and the Ionic Rhegium, founded from Chalcis, complete the series of flourishing cities which made southwestern Italy appear as a new and richer land of the Hellenes, as Megale Hellas, *Magna Græcia*. The turning point in its prosperity was the war between the two foremost of the Achæan cities, ending in the destruction of Sybaris by Croton, (520 B.C.) By this event, just at the time when the Ionians of Asia Minor were passing under the sway of Persia, the Greeks of Italy were rendered less able to make head against the native tribes of the peninsula. The name Megale Hellas remained, but its old significance was gone; the spirit of confident progress had been quenched.

When Attica first comes into the view of history, it already forms a single state of which Athens is the capital; the kingly period is over, and, though a close oligarchy still exists, there are signs of coming change.

The transition from monarchy to oligarchy was more gradual at Athens than it seems to have been elsewhere. First, the priestly office of the king was taken away; and, as the old name *basileus* implied religious as well as civil authority, he was henceforth called simply the ruler, *archon*. But the office of archon was still held for life, and was hereditary. The second step was to appoint the archon for ten years only. The third and last step was to divide the old regal power among nine archons appointed annually, (683 B.C.) The first archon, called Eponymos, because his name marked the date of official documents, had a general supervision of affairs, and in particular represented the state as the guardian of orphans and minors; the second archon was high priest (*basileus*); the third was commander-in-chief (*polemarch*); the remaining six were the custodians of the laws ("thesmothetæ"). After this reform, two events are the chief landmarks of Attic history before Solon. The first is the legislation of Draco, the second is the revolution of Cylon. Draco was commissioned, not to frame a new code, but to write down the laws as they existed in oral tradition. To a later age the laws of Draco became a proverb of severity; but their severity was that of the rude age from which they had come down, not of the man who was employed to tabulate them. By this code (620 B.C.), and by the establishment of a court of fifty-one judges in capital cases, the people were so far secured against abuse of the judicial office. But the existence of serious popular discontent a few years later is shown by the attempt of Cylon, (612 B.C.) Stimulated by the example of his father-in-law, Theagenes, the tyrant of Megara, he resolved to seize the supreme power at Athens. Promises of relief and of a new agrarian law gained him adherents among the distressed classes; but when he had succeeded in seizing the Acropolis, he found himself disappointed of popular support and surrounded by the troops of the archons.

Solon was now to come forward as the umpire of still graver issues. The influence of his ardent and lofty nature on the people is expressed in the legend

that his recitation of his elegy, "Salamis," fired them to strike the blow by which the "fair island" was won back from the Megarians.

The removal of the urgent pressure of usury, the substitution of wealth for birth as the canon of privilege, and the bestowal of strictly limited political power on the people were Solon's achievements. It is no proof of their inadequacy that they were soon followed by the appearance of a successful demagogue. The Attic population was locally divided into three classes—the Diacrii, or the "highlanders" of the northeast district (the poorest); the Parali, the boatmen and fishermen of the coast; and the "Pediæis," the richer farmers of the Attic plain. Each of these classes formed a political faction, with an ambitious noble at its head. The Diacrii were led by Pisistratus, the Parali by Megacles, the Pediæis by Lycurgus. On the pretense that he had been murderously assaulted by the enemies of the people, Pisistratus obtained a guard of fifty men. It was presently increased to four hundred. He then seized the Acropolis, (560 B.C.). After having being twice driven out by the combined factions of the Plain and the Shore, he finally established himself as tyrant in 545 B.C., and reigned till his death in 527 B.C. He did not abolish Solon's constitution, though he reserved some of the higher offices for members of his own house. His government appears to have been mild and wise. He set the example of submission to the laws. By many new enactments he promoted good order and morality. The convenience of the citizens and the beauty of Athens were consulted by the construction of new buildings, roads and aqueducts. There were but two things to remind Athenians that this paternal rule had been founded in force—the presence of hired troops and the levy of tithes on private lands. Pisistratus was succeeded by his eldest son Hippias. In 514 B.C. Hippias, the brother of Hippias, was murdered by Harmodius and Aristogiton, in revenge for an affront offered to the sister of Harmodius. The rule of Hippias, which had hitherto resembled that of his father, now became cruel. The Alcmeonidæ—who had been in banishment since the final return of Pisistratus in 545—had won the favor of the Delphic priesthood by an act of liberality. The temple at Delphi having been burned down, they had undertaken to rebuild it, and instead of common limestone, which would have satisfied the contract, used Parian marble for the east side of the temple. They now exerted their influence. Whenever Sparta or a Spartan consulted the oracle, the response always included a command to set Athens free. At last Cleomenes, king of Sparta, took the field. The children of Hippias fell into his hands, and to save them, Hippias voluntarily withdrew from Athens, (510 B.C.) The rule of the Pisistratid house was now at an end. In the phrase of the song which gave ill-merited glory to Harmodius and Aristogiton, Athens was once more under equal laws.

As a safeguard for the state against party struggles, it was provided that, if the Council and the Ecclesia should declare the commonwealth to be in danger, each citizen might be summoned to indicate by ballot the name of any man whom he thought dangerous, and that, if the same name was written on 6,000 tickets, the man so indicated should go into exile for ten years, without, however, losing his civic rights or his property. This was the institution of ostracism. Finally, choice by lot was substituted for voting in the election to the archonship, thus diminishing the danger of factious partisanship.

Isagoras, the leader of the party opposed to these reforms, had a zealous ally in Cleomenes, king of Sparta. Clisthenes, they alleged, was aiming at a tyranny such

as that of his grandfather and namesake at Sicyon. Sparta, the leading Dorian state, was in a manner the recognized champion of aristocracy against revolution. The Spartan herald summoned the Athenians to banish the accursed Alcæonidae, and Clisthenes voluntarily left Attica. Cleomenes arrived at Athens with his army. Isagoras was made archon; seven hundred "democratic" families were banished; the newly constituted council of five hundred was dissolved. But now the people rose in arms. Cleomenes and Isagoras were besieged on the Acropolis. On the third day of the siege they surrendered. Cleomenes and his troops were allowed to withdraw. Isagoras escaped, but his Athenian adherents were put to death. Clisthenes now returned to Athens. He seems, however, to have excited popular indignation by promoting a treaty with Persia, by which the supremacy of the Persian king was acknowledged. He thus lent color to the accusation of his enemies that he was aiming at a tyranny; and he was banished. Cleomenes presently invaded Attica a second time, with the Peloponnesian allies. But the other Spartan king, Demaratus, was opposed to his designs. The Corinthians refused to follow him, and his army broke up when it had advanced no further than Eleusis. Meanwhile the Thebans and the Chalcidians of Eubœa had been induced to take up arms against Athens. Freed from the danger of the Peloponnesian invasion, the Athenians marched against the Thebans. They found them on the shore of the Euripus, and routed them. Crossing the strait into Eubœa, they defeated the Chalcidians on the same day. The lands of the Chalcidian knights (Hippobotæ) were divided in equal lots among four thousand Athenians, who occupied them, not as colonists forming a new city, but as non-resident citizens of Athens. This was the first *kleruchia*. The Spartans, incited by Cleomenes, now made a final effort to repress the democratic strength of Athens. Hippias was invited from his retreat on the Hellespont to Lacedæmon, and a Peloponnesian congress was convened at Sparta to discuss a project for restoring him to Athens as tyrant. The representative of Corinth urged that it would be shameful if Sparta, the enemy of tyrannies, should help to set up a new one. The congress was of his mind. The scheme failed, and Hippias went back to Sigeum.

In these five years (510-505) which followed the fall of the Pisistratide the future of Athens was decided. Athens had become a free commonwealth, in which class grievances no longer hindered the citizens from acting together with vigorous spirit. The results were soon to appear in work done by the Athenians, not for Athens only, but for all Greece.

The time was now drawing near when Greece was to sustain its first historical conflict with the barbarian world. There was not, in the modern sense, an Hellenic nation. But there were common elements of religion, manners, and culture, which together constituted an Hellenic civilization, and were the basis of a common Hellenic character. The first historical event in which the unity of Greece found active expression was the struggle with Persia.

The twelve Ionian cities on the western coast of Asia Minor formed a community which kept itself thoroughly distinct from the Æolian colonists to the north and the Dorians to the south. The Pan-Ionic festivals preserved the memory of the common descent. The Ionian life and culture had a character of their own. But the Ionian cities had no political cohesion, nor had they any recognized leader. One after another they became tributary to the kings of Lydia. The process of subjugation commenced at the time when the Lydian dynasty of the Mermnadæ (about 716 B.C.) began to make themselves independent of Assyria. It was completed by

Croesus, to whom, about 550 B.C., all the Ionian cities had become subject. Croesus was friendly to the Greeks; he respected their religion, and enriched its shrines; he welcomed distinguished Greeks to Sardis. All that was exacted from the Ionians by Croesus was that they should acknowledge him as their suzerain, and pay a fixed tribute. The Persians, under Cyrus, defeated Croesus and conquered Lydia about 547 B.C. The whole coast-line of Asia Minor was afterward reduced by Harpagus, the general of Cyrus. The Persians, zealous monotheists, destroyed the Greek temples. But it was not till the reign of Darius, who succeeded Cambyses in 521 B.C., that the Ionians felt the whole weight of the Persian yoke. Darius, the able organizer of the Persian empire, preferred that each Ionian city should be ruled by one man whom he could trust. He therefore gave systematic support to tyrannies.

In 502, Aristagoras undertook to restore the exiled oligarchs of Naxos, and for this purpose obtained 200 Persian ships from Artaphernes, the satrap of western Asia Minor. The enterprise miscarried. Aristagoras, dreading the anger of Artaphernes, now began to meditate revolt. He was encouraged by secret messages from Histæus, who hoped to escape from Susa by being sent to suppress the rising. Aristagoras laid down his tyranny, and called on the people of Miletus to throw off the Persian yoke. The other Ionian cities followed the example. They deposed their tyrants and declared themselves free. The Æolian and Dorian settlements made common cause with them. Cyprus also joined in the revolt, (500 B.C.) Aristagoras next sought aid beyond the Ægean. Sparta held aloof, but five ships were sent by the Eretrians, and twenty by the Athenians. The united Greek force surprised Sardis, and set fire to it, but was presently driven back to the coast. The Athenians then went home. Darius was deeply incensed by this outrage. The whole Persian force was brought to bear on Ionia, and Miletus was invested by land and sea. In a sea fight off Lade, an island near Miletus, the Ionians were decisively defeated by a Persian fleet of nearly twice their number, partly through the shameful desertion of the Samians and Lesbians during the battle, (496 B.C.) The Persians soon afterward took Miletus by storm, (495 B.C.) The Greek cities of the Asiatic seaboard and of the Thracian Chersonese successively fell before them.

But the vengeance of Darius was not yet complete. He could not forget that Greeks from beyond the sea had helped to burn Sardis, and he resolved that the punishment of Athens and Eretria should be as signal as that of his own vassals in Ionia. A Persian army, under Mardonius, crossed the Hellespont and advanced through Thrace. But the Persian fleet which accompanied it was shattered by a storm in rounding Mount Athos. The progress of Mardonius was also checked by the Thracians, and he retreated to Asia.

In 490 B.C. the second Persian expedition crossed the Ægean under the command of Datis and Artaphernes. Naxos was sacked, Eretria was betrayed. It seemed hardly doubtful that Athens too must fall. The Persians landed in the bay of Marathon, inclosed by the spurs of Brilessus (Pentelicus) and the hills of the Diaeria. They thus avoided the dangers of a voyage round a rocky coast; and no part of Attica, Hippias told them, was so favorable to cavalry. The Athenians had sent for help to Sparta; but a religious scruple forbade the Spartans to march before the time of the full moon. Nine thousand Athenian citizens, with the slaves who carried their shields, went forth to meet the Persians at Marathon. On the way they were joined by a thousand Plateans — the whole force of that city — who came to stand by their old protectors. Miltiades, formerly the ruler of

the Chersonese, was one of the ten Athenian generals. Five of these voted for awaiting Spartan help. The other five, led by Miltiades, were for giving battle at once; and the vote of the polemarch, Callimachus, turned the scale in their favor. The Greeks charged down from the hillside upon the Persians. The Greek center was driven in, but the Greek wings prevailed, and then closed upon the Persian center. The Persians fled to their ships. Six thousand Persians fell. The Greek loss was about 192. Believing that traitors at Athens had signaled to the Persians to surprise the city while undefended, the army hastened back. The Persian fleet soon approached, but seeing troops on the shore, sailed away for Asia.

After the victory of Marathon Miltiades was all-powerful at Athens. He asked the people to give him a fleet, in order that he might strike another blow at Persia while the effects of Marathon were fresh. His demand was granted. But he employed the fleet in an attempt to wreak a private grudge on the island of Paros. At the end of twenty-six days he returned to Athens baffled, and suffering from a wound in the thigh. He was indicted for having deceived the people, and was sentenced to a fine of about £12,000. Being unable to pay it, he was disfranchised as a public debtor. His wound mortified, and he died, leaving debt and dishonor to his son Cimon. Aristides was now the most influential man at Athens, as Themistocles was the ablest. Themistocles foresaw that the Persians would return, and that Athens could resist them only on the sea. He aimed therefore at creating an Athenian navy. Already (491 B.C.) he had persuaded the Athenians to set about fortifying the peninsula of the Piræus, which, with its three harbors commanded by the height of Munychia, offered greater advantages than the open roadstead of Phalerum. He now urged that the revenues from the silver mines of Laurium should be applied to building a fleet. The frequent hostilities between Athens and Ægina enforced the advice. Before 480 B.C. Athens had acquired 200 triremes. Aristides was at the head of a party who viewed this movement with alarm. The strife of parties came to an issue. An ostracism was held, and Aristides was banished—probably in 484 or 483 B.C. Themistocles remained the leader of Athens in the new path which he himself had opened. Athens was now the first maritime power of Greece.

The repulse at Marathon had probably not prevented the Persian commanders from representing their expedition as in a great measure successful. Darius resolved on the complete subjugation of Greece. But, when vast preparations had been in progress for three years, he died, leaving the throne to Xerxes, the eldest of his four sons, by Atossa, the daughter of Cyrus, (485 B.C.) Xerxes was not, like his father, a born ruler or trained warrior. But he was profoundly convinced that all human beings were the natural slaves of the Persian king; and he was influenced by a strong war-party in the palace, with Atossa and Mardonius at its head. The house of Pisistratus, the ambitious Alcæadæ of Thessaly, and Demaratus, the exiled king of Sparta, united in urging an invasion of Greece. It was in vain that Artabanus, the uncle of the king, argued on behalf of the moderate party at the court. Orders were given to raise such an armament as the world had never seen—a host which should display the whole resources of the empire from the Indus to the Ægean, from the Danube to the Nile. Forty-six nations were represented by the forces which wintered at Sardis, in 481 B.C. A fleet of 1,200 triremes, and about 3,000 transports and smaller craft, assembled near Cyme and Phocæa, on the Ionian coast. In the spring of 480 B.C. Xerxes led about

a million of men to the Hellespont, whither the fleet went before to meet them.

Greece was probably never stronger than it was at this time. The population of the Peloponnesus may have been about 2,000,000. Athens, according to Herodotus, had 30,000 citizens. The Bœotian towns and the islands were prosperous. The proportion of slaves to freemen varied from perhaps four to one at Athens, to as much as ten to one at Corinth or Ægina. Life was still simple and vigorous. Society was not divided into rich classes enervated by luxury, and poor classes enfeebled by want. The public palæstras were schools of physical training for war. But that which Greece lacked was political unity. Aristocracy and democracy were already rival forces. Sparta, as the leading city of Greece, took the first step toward the formation of a national party, by convening a congress at the isthmus of Corinth, in the autumn of 481.

The first idea of the national defense was to arrest the torrent of invasion at some northerly point which could be held against great numerical odds. Tempe proving untenable, it was resolved to make a stand at Thermopylæ. When Leonidas had fallen with his 300 Spartans and the 700 Thespians who shared their heroic death, the next object of the Peloponnesian allies was to guard the isthmus of Corinth. The peculiar misfortune of Athens in the war was her position between two gates, the first of which had been forced by the enemy. The Greek leaders seem to have assumed at first that it was vain to oppose the Persian land forces in an open field. Xerxes occupied Athens, and the flames which destroyed its houses and temples at last avenged the burning of Sardis. The Greek ships, which had gained some advantage over the Persian fleet at Artemisium in the northern waters of the Eubœan strait, had moved to Salamis as soon as it was known that the Persians had passed Thermopylæ. The homeless population of Athens had been conveyed to Salamis, Ægina, and Trœzen before the arrival of Xerxes. And now the forecast of Themistocles was verified. Athens, and Greece itself, were saved chiefly by the Athenian ships,—200 in number out of a total of 366. The Peloponnesian leaders wished to withdraw the fleet to the isthmus. Themistocles saw that if it left Salamis it would disperse. He sent word to Xerxes that the Greeks meditated escape. The Persian fleet surrounded them in the night. Next day the battle of Salamis was fought. Of 1,000 Persian ships, 200 were destroyed; the rest fled. It was on the same day that Gelon of Syracuse defeated the Carthaginians at Himera in Sicily, (480 B.C.) Xerxes lost heart and retreated to Asia, leaving Mardonius with 300,000 men to finish the war. In the summer of 479, Athens was again occupied and destroyed by the Persians. Now at length Sparta came to the rescue. Pausanias, the guardian of the young son of Leonidas, led 110,000 of the allies into Bœotia, and utterly defeated the army of Mardonius near Platea, (479 B.C.) On the same day the troops of the Greek fleet defeated those of the Persian fleet in a battle on the shore at Mycale near Miletus. This victory set Ionia free from Persia.

In the space from the Persian to the Peloponnesian War the central interest belongs to Athens. The growth of Athenian empire, the successive phases through which it passed, and its influence on the rest of Greece, the inner development of Athenian life, political, intellectual, social,—these are the salient features in a period of about fifty years. The first care of Themistocles after the repulse of the Persian invasion was to restore the fortifications of Athens. The jealous interference of Sparta instigated by Ægina and Corinth, was defeated by his ingenuity. A wall of larger circuit

than the old one was built round Athens, and a strong wall was also carried round Piræus.

The league, of which Athens now became the head (477 B.C.), was intended to continue the national defense against Persia. Its special purpose was to guard the *Ægean*. Aristides was chosen to assess the rate of contribution for the members. The representatives of the several cities met at the temple of Apollo in Delos, where the common fund was also deposited. Hence the league was called the Confederacy of Delos. It was only gradually that this free confederacy, with Athens for a president, passed into an Athenian empire over tributary cities. At first each city contributed ships to the common fleet. But the practice arose of allowing some cities to contribute money instead of ships. A city which did this had no control over Athens, and no protection against attack. One after another of the discontented allies revolted from Athens, and was forcibly reduced to the condition of a subject. Naxos was the earliest example (466 B.C.); Thasos was the next (465 B.C.); and as early as 449 B.C. only three insular allies remained free,—Samos, Lesbos and Chios. The transfer of the common fund from Delos to Athens (about 459 B.C.) was merely the outward sign of a change in which most members of the original league had already been compelled to acquiesce. In the earlier years of the Confederacy the work for which it had been formed was not neglected. Of the successes gained against Persia the most notable was the victory of Cimon over the Persians, both by land and by sea, at the mouth of Eurymedon, (466 B.C.) But, as Athens assumed more and more distinctly an imperial character, the common fund came to be regarded as a tribute which could be applied to exclusively Athenian objects. This was the grievance which made the very name of the "tribute" so hateful.

The years 457-455 B.C. may be taken as marking the greatest extension of the Athenian empire. It was in 457 that their victory at *Ænophyta* in *Boeotia*, following on their defeat at *Tanagra*, enabled the Athenians to break up for a time the oligarchical league over which Thebes presided. Democracies were established in the *Boeotian* towns, and Athens was virtually supreme, not only in *Boeotia*, but also in *Phocis* and *Locris*. In 455, after a struggle of some years, Athens conquered *Ægina*. But now the tide began to turn. In 453 the defeat of the Athenians at *Coronea* destroyed the power of Athens in *Boeotia*, *Phocis*, and *Locris*. Oligarchies were restored. First *Eubœa* and then *Megara* revolted from Athens. The Spartans, released from a truce of five years (452-447), invaded *Attica*. They advanced, however, no further than the *Thriasian* plain; and it was believed that their leader, the king *Pleistoanax*, had taken Athenian bribes. Freed from this danger, Pericles was enabled to reduce *Eubœa*. But the dream of an Athenian land-empire was over. In 445 a truce for thirty years was concluded between Athens and Sparta. Athens gave up all dependencies on the mainland of Greece. Henceforth the Athenian empire was to be maritime only.

Between the conclusion of the Thirty Years' Truce and the events which led to the Peloponnesian War, the most important incidents were—first, the revolt of *Samos* and its reduction by Athens (440 B.C.); next, the foundation by Athens of two settlements, *Thurii*, on the site of *Sybaris* in southern Italy, and *Amphipolis*, on the *Strymon*, in *Thrace*.

The period known as "the age of Pericles" may be roughly defined as the years from 460 to 430 B.C. The idea which pervades the whole work of Pericles is that the Athenian people, having been called upon by circumstances to rule over a wide alliance, must be trained

to rule worthily. Pericles was opposed to extending the empire of Athens; but he was resolved to hold it, because he saw the danger of giving it up. And, in order that it should be held securely, he saw that the people must be educated, first, politically, by constitutional freedom, and next, intellectually and socially, by general cultivation.

The first period of the Peloponnesian war comprises the years from its commencement in 431 B.C. to the peace of *Nicias* in 421—hence, sometime, called the Ten Years' War. As one of its main features was the frequent invasion of *Attica* by the Peloponnesians, the latter called it the *Attic* War. The result of it was that Sparta had gained nothing, and that Athens had lost nothing except *Amphipolis*.

The second period of the war extends from the peace of *Nicias* in 421 to the catastrophe of the Sicilian expedition in 413. The four years immediately following the peace of *Nicias* are the only years during which the great fundamental antithesis on which the whole war rested was temporarily obscured. Many of the allies of Sparta were discontented, and the intrigues of *Alcibiades* were active among them. But it was in vain that oligarchical allies were gained for the moment to the democratic cause. The normal relations were soon restored. Then came the Athenian expedition to Sicily, ending in a crushing disaster.

The third and last period of the war is from the Sicilian defeat in 413 to the taking of Athens by *Ly-sander* in 404, a few months after the battle of *Ægospotami*. This is the period called the *Decelean* War, because *Decelea* in *Attica* was occupied by the Spartans in 413, and continued to be a permanent base of their operations against Athens. As the sea board of Asia Minor was the scene of much of the fighting, it is sometimes also called the *Ionian* War.

Sparta itself was changed. The old Spartan institutions had taught a simple reliance on disciplined strength. In the Peloponnesian War Sparta had won the victory with Persian gold. Already the love of money had found its way into the state which had once been so carefully protected from it. Differences of degree had arisen between the citizens, whose equality had been the very basis of the old Spartan life. Citizens who had been impoverished by the rise of prices, and who could no longer pay their share of the public tables, were now distinguished as "inferiors" from those who retained their full civic rights. Spartan commanders abroad were not always inaccessible to bribes. The habit of military discipline indeed remained. Spartans were still distinguished, as a rule, by gallantry in the field, by care for the dead and by attention to the ritual of the gods. The old type of Spartan leader—the rough soldier incapable of eloquence or of finesse—had ceased to be the only type.

Sparta had waged the Peloponnesian War in the name of freedom. The Greek cities were to be liberated from the all-absorbing tyranny of Athens. Now, however, Sparta altogether failed to redeem these pledges. On the contrary she aimed at setting up a tyranny of her own. Oligarchical governments were established, controlled in each city by a Spartan garrison under a Spartan harmost or military governor. The earliest and one of the worst cases was the tyranny of the thirty tyrants at Athens, set up by *Ly-sander*, and supported by Spartan arms until, after eight months, the Athenian exiles under *Thrasybulus* marched from *Phyle* upon Athens. The Athenian democracy was formally restored in September, 403 B.C.; and the liberators used their victory with a wise moderation. Four years later *Socrates* was put to death, because a party blindly zealous for the old beliefs of

Athens could not see that such thought as his led to the only firm basis for a new social order.

The retreat of the 10,000 Greeks under Xenophon, in 401 B.C., marks a turning-point in the relations of Greece to Persia. It was to the Greeks a striking revelation of Persian weakness, an encouragement to schemes of invasion which would before have seemed wild. Sparta now began a war against the Persians in Asia Minor—partly to escape from the reproach of having abandoned Asiatic Hellas to the barbarian. Agesilaus, on whom the lesson of the famous retreat had not been lost, was encouraged by success to plan a bolder campaign. But in 394 B.C. the Athenian Conon, commanding the fleet raised by the satrap Pharnabazus, utterly defeated the Spartan fleet at Cnidus. Soon afterward, under his protection, the Long Walls of Athens were restored. The Spartan power in Asia Minor was at an end. The oligarchies were overthrown, and the Spartan governors expelled.

The reverses of Sparta did not end here. At the instigation of Persia an alliance was formed between Athens, Thebes, Argos, and Corinth. In the territory of the latter state the allies waged war on Sparta, to whose aid Agesilaus was recalled from Asia. When the Corinthian War had lasted six years, the peace of Antalcidas was negotiated between Sparta and Persia, (387 B.C.) By it the Greek cities in Asia, with Cyprus, were given up to Persia. Lemnos, Imbros, and Scyros were assigned to Athens. All other Greek cities were declared independent. The meaning of this was that they were to be independent of each other—isolated for purposes of defense—and all alike dependent on the Great King. The Corinthian War had begun from Persian intrigue; it ended with a peace dictated by Persia.

A few years later these designs met with their first serious check. In 382 B.C. the Spartans treacherously seized the Cadmea or citadel of Thebes. They held Thebes for three years. But in 379 a party of Theban exiles, under Pelopidas, surprised the Spartan garrison and recovered the city. A still greater discouragement to Sparta was the establishment of a new Athenian Confederacy—precautions being taken against the members passing, as under the Delian Confederacy, into the condition of mere tributaries. Thebes joined the new confederacy, and presently succeeded in restoring the old Boeotian league, of which Thebes was the head. But the rise of Thebes had excited Athenian jealousy. Peace was made in 371 between Athens and Sparta. Thebes, thus isolated, was at once attacked by the Lacedaemonians. They invaded Boeotia, but were defeated by the Thebans under Epaminondas at Leuctra, 371 B.C. This destroyed Spartan power outside of the Peloponnesus. Epaminondas next invaded the Peloponnesus itself. The Arcadian league did not long hold together. Mantinea led a group of Arcadian towns favorable to Sparta. In 362 B.C. a battle was fought near Mantinea between the Spartans and the Thebans. The Thebans were victorious, but Epaminondas fell. With his death the temporary supremacy of Thebes came to an end. Sparta had, however, been reduced from the rank of a leading state.

Political confusion is indeed the general characteristic of the period between the end of the Peloponnesian War and the Macedonian conquest of Greece. In the preceding century Athens and Sparta had been the vigorous representatives of two distinct principles. The oligarchic cities rallied round Sparta, the democratic round Athens. But at the end of the Peloponnesian War Athens was exhausted. Sparta, now predominant, but suffering from inner decay, exercised her power in such a manner as to estrange her natural

allies. Thus both the normal groups of states were broken up. New and arbitrary combinations succeeded, seldom lasting long, since they were prompted merely by the interest or impulse of the hour.

Three years after the death of Epaminondas Philip came to the throne of Macedon. His power rapidly grew. A warlike people, ruled by an able and ambitious king, was now the northern neighbor of Greece. The most obvious vice of Greek politics at this period was disunion; but the disunion itself was only the symptom of a deeper decay. No one city of Greece any longer retained the vigor required in a leader. Had either Athens or Sparta now possessed such vital force as they showed in the Persian wars, no local or temporary feuds would have prevented the organization of national defense. Nothing marks the decay of the Greek commonwealths more significantly than the fact that they did not even recognize the urgency of the danger. Demosthenes had the old Greek spirit; but he stood almost alone. The principles on which he constantly insisted, and which gave unity to his entire career, are mainly two—first, the duty of Athenian citizens to sacrifice personal ease and gain to the service of Athens; secondly, the duty of Athens, as the natural head of free Greece, to consult the interests of all the Greek cities. The energy of Demosthenes was not first roused by the progress of Philip. Before there was danger from the quarter of Macedon, Demosthenes had seen clearly that the decay of public spirit threatened the destruction of Hellenic life. As he said to the Athenians afterward, if Philip had not existed they would have made another Philip for themselves. And the condition of Athens was at least not worse than that of any other city which could have aspired to lead.

A strategist so keen-sighted as Philip must early have perceived that he had little to fear from combined resistance, so long as he was careful not to attack too many separate interests at the same time. Greeks, he saw, were past fighting for each other as Greeks. This was the key-note of his policy to the last. While making aggressions on one Greek city or group of cities, he always contrived to have others on his side.

Philip's career in relation to Greece has two periods. The end of the first period is marked by his admission to the Amphictyonic Council; the end of the second, by the battle of Chaeronea. During the first period, Philip is still a foreign power threatening Greece from outside. He takes Amphipolis from the Athenians; he destroys Potidæa; he acquires towns on the Thracian and Messalian coasts; he defeats the Phocians under Onomarchus, and even advances to Thermopylae, to find the pass guarded by the Athenians; finally, he destroys Olynthus and the thirty-two towns of its confederacy. In the second period he is no longer a foreign power. Having intervened in the Sacred War and crushed the Phocians, he has taken the place of Phocis in the Amphictyonic Council, and has thereby been admitted within the circle of the Greek states. The First Philippic, and the three Olynthiac speeches of Demosthenes, belong to the first of these periods. The speeches On the Peace, On the Embassy, On the Chersonese, and the two later Philipppics, belong to the second. In the Third Philippic, the climax of his efforts before Chaeronea, Demosthenes reviews the progress of Philip from the Hellenic, not merely from the Athenian, point of view. Philip has destroyed Olynthus; he has ruined Phocis; he has sown dissensions in Thessaly; Thebes is afraid of him; he has gained Euboea and the Peloponnesus; he is supreme from the Adriatic to the Hellespont; and the last hope of Greece is in Athens. Demosthenes succeeded in winning back Byzantium to the Athenian alliance, and in persuading Thebans to

fight by the side of Athenians; but he could not avert the catastrophe of Charonea.

After the victory which made him master of Greece, Philip deprived Sparta of her conquests in the Peloponnese. The Messenians, Arcadians, Argives, recovered their old possessions. A congress was then summoned at the isthmus of Corinth. Macedonia and the Greek states were united in a federal league. A federal council was constituted to guard the federal laws; and the Delphic Amphictyony was recognized as a tribunal to which this council should refer any breach of those laws. Philip, representing Macedonia, the most important member of the league, was acknowledged as its head or president. His position in regard to the Greek cities was thus in form much the same as that of Athens or Sparta in former days.

If Greek liberty had received a fatal blow in Greece proper, there was another part of Hellas in which, almost simultaneously, it had been vindicated with splendid success. While Demosthenes was making his heroic resistance to the designs of Macedon, the enemies of Hellenic freedom in Sicily had been encountered with equal vigor and happier fortune by Timoleon. A few years after the defeat of the Athenian armament in 413, Sicily had suffered two invasions of the Carthaginians. Selinus and Himera, Agrigentum, Gela, and Camarina, had successively fallen. The first Dionysius, in consolidating his own tyranny at Syracuse, had been content to leave half the island in the hands of the foreign foe. The feeble misrule of his son, Dionysius II., produced a series of revolutions. A party at Syracuse invoked the aid of Corinth. Timoleon was sent with only 1,200 men, (343 B.C.) His first work was to deliver Syracuse from the contending forces of Dionysius and a rival named Hicetas, and to restore the Syracusan democracy. His next work was to drive the Carthaginians out of Sicily. He defeated them with crushing effect at the river Crimessus, (340 B.C.) The Sicilian Greeks were now free. Sicily entered on a new period of prosperity, which lasted until Agathocles became tyrant of Syracuse, (317 B.C.) Thus the brightest days, perhaps, of Hellenic Sicily coincided with those in which the cities of the Hellenic mainland were learning to bear the Macedonian yoke.

The time seemed now to have come for an enterprise which, since the retreat of the Ten Thousand, had been the dream of many Greek captains, but which none had yet been in a position to attempt. Philip, in the forty-seventh year of his age, had declared war against Persia, and was preparing to invade Asia at the head of an army gathered from all Greece, when he was assassinated by a young Macedonian noble in revenge for a private affront, (336 B.C.) Alexander, Philip's son and successor, was only twenty. Marching into Greece, he promptly repressed an insurrectionary movement, and was recognized by a new assembly at Corinth as commander-in-chief of the Greek armies. He next marched against the tribes on the northern borders of Macedonia. While he was absent on this expedition, the Thebans rose against the Macedonian garrison. Alexander returned, took Thebes, and razed it to the ground, (335 B.C.) At Corinth he received the homage of the Greek states, and then returned to Macedonia.

Alexander was now free to execute the designs of Philip. As captain-general of Hellas, he set forth to invade the Persian empire, and to avenge the wrongs suffered by Greece at the hands of the first Darius and of Xerxes. The army with which he crossed the Hellespont in 334 B.C., numbered perhaps about 30,000 infantry and 4,000 cavalry. It was composed of Macedonians, Greeks, and auxiliaries from the barbarian tribes on the Macedonian borders.

Alexander's career of conquest has three stages, marked by his three great battles. The victory at the Granicus (334 B.C.) gave him Asia Minor. The victory at Issus (333 B.C.) opened his path into Syria and Egypt. The victory at Arbela (331 B.C.) made him temporary master of the whole East. Asia Minor was by degrees thoroughly Hellenized, and remained Greek till the Turks came in the eleventh century. Syria and Egypt were not indeed Hellenized as whole countries, but their capital cities, Antioch and Alexandria, were Hellenic; and the control established by Alexander was retained by Macedonia or by Rome for centuries. At the third stage, however, Alexander's conquests entered upon an entirely new phase, and compelled him to take up an altogether new position. Neither in his Hellenic nor in his Macedonian capacity could he put forward any effective claim to hold the Persian empire proper,—the empire stripped of its Egyptian, Phœnician, and Hellenic dependencies. He could hold Persia only as a Persian king, as the successor of those Achaemenid kings whose dynasty he had overthrown. The constitutional king of Macedonia, with limited prerogatives, the elective captain of Greece, must now assume a third and distinct character. He must be also a Persian king, an irresponsible despot.

The colonies planted by Alexander in his progress through Asia make the beginning of a new period in Hellenic history.

The results of Alexander's conquests were beneficent chiefly in two ways: first, by liberating the hoarded treasures of the Eastern kings, and so stimulating industry and commerce; secondly, by opening Asia to a new civilization, which helped to promote intellectual and moral progress, even in those places where its influence was limited or transient. In the process of doing this much that was valuable may have been destroyed. But it can hardly be questioned that on the whole the gain far outweighed the loss. If Alexander had not died at the age of thirty-two, leaving his work unfinished, it would perhaps have been easier to judge how far he deserves the credit of having contemplated these benefits to mankind.

The later history of the Greeks, from the end of Alexander the Great's reign to the taking of Constantinople by the Turks, may be divided most naturally into five periods, viz.—I. The period of Greek subjection; from the death of Alexander to the accession of Constantine the Great as sole emperor, 323 B.C. to 323 A.D. II. The period of Greek revival; from Constantine the Great to Leo III. (the Isaurian), 323–716 A.D. III. The period of Byzantine prosperity; from Leo III. to Isaac I. (Comnenus), 716–1057 A.D. IV. The period of Byzantine decline; from Isaac I. to the taking of Constantinople by the Latins, 1057–1204 A.D. V. The period of Greek survival; from the taking of Constantinople by the Latins to its conquest by the Turks, 1204–1453 A.D.

The history which we thus enter upon is of importance and interest in a different way from that of the classical age of Greece. That age was a unique development in respect of national life and character, of social and political institutions, and of every form of cultivation, and was marked by concentrated energy and intense vigor. The later period is important because of its wide-reaching influence on the world at large, and because it is one, and that the more continuous, of the two great chains of events, in eastern and western Europe respectively, which connect the earlier and later history of civilized man.

The first of these concerns the character of the Greeks during the time of their subjection to the Romans, and in particular under the early emperors, in which age

they are often supposed to have been a demoralized and unprincipled race. The later Greeks no doubt had degenerated from their great forefathers; but it is only fair to remember that this was to a great extent the result of their circumstances. The rapid growth of Greek culture and Greek political ideas was naturally followed by rapid decay. In sculpture the early archaic style developed in a few decades of years into the manly and perfect style of Phidias, and the change was equally rapid to the luxurious style of Praxiteles, in which the elements of decadence were already traceable. The same thing is apparent in the history of the drama.

The other misconception relates to the Byzantine empire, which has been commonly regarded as a period of steady decline and feebleness and decrepitude. The author who is mainly responsible for the prevalence of this view is Gibbon; and it is strange that a writer who was gifted with such profound historical insight should not have perceived that the state which accomplished such great things could not have been powerless. The passage in which he expresses himself on this subject is well known. "I should have abandoned without regret," he says, "the Greek slaves and their servile historians, had I not reflected that the fate of the Byzantine monarchy is passively connected with the most splendid and important revolutions which have changed the state of the world." Yet it was this same empire which beat back for centuries, and ultimately survived, first the Saracens and afterward the Seljuks, both of which peoples would otherwise have overrun Europe, and which, even in its decline, kept at bay for more than a hundred years the Ottomans when at the height of their power, thereby providing the Western nations with a breathing space, without which the career of Turkish conquest would certainly not have been arrested at Vienna, but might have extended to the Elbe or the Seine. During the eighth, ninth and tenth centuries its military power was the strongest in Europe, and the individual prowess of its aristocracy was unrivaled, while at the same time its long succession of able emperors and administrators is such as no other monarchical government can show. Its influence is further shown by its missionary effort, resulting in the conversion to Christianity of the south Slavonic nations and the Russians, and the consequent spread of civilization throughout the countries they inhabited; by its widely extended commerce both by land and sea; and by its art, especially its architecture, which contributed to the formation of other styles from Egypt to the north of Russia, and from India to Spain.

The conquests of Alexander the Great differed from those of almost every other great conqueror in this—that they were followed up by a scheme of civil government, the object of which was to secure the well-being and promote the civilization of all his subjects. That he was not the ambitious madman which he is often represented as being, is amply proved by the forethought with which his campaigns were planned, and by his attention to the commissariat and to other details connected with the transport and maintenance of his vast armies. But his true greatness is most clearly shown by his endeavoring to introduce unity into his vast empire, not by subjecting one race to another, or crushing out the hope of further resistance by an iron rule, but by establishing in its centers of permanent institutions and common culture. These were the Greek colonies with municipal government which he founded at intervals throughout Asia. By these the subject countries, without being forced into a common mold, or organized in defiance of their feelings and prejudices and without reference to their national institutions, were gradually leavened by the system that existed among them, and obtained a certain infusion of the Hellenic character and Hellenic modes

of thought. Though Alexander himself did not survive to complete his project, yet enough had been accomplished at the time of his death to leave its influence firmly imprinted, even when his empire fell to pieces and was partitioned among his generals. The consequences of this to Asia were of incalculable importance, and continued unimpaired until the tide of Mahometan conquest swept over the country; and even then it was from Greek literature and art that the Arabs obtained the culture for which they have been celebrated. The Hellenic world was henceforth divided into two sections—the Greeks of Greece proper, and the Macedonian Greeks of Asia and Egypt. The non-Greek inhabitants of the countries in which the Greeks were settled were described as "Hellenizing," and consequently their language, such as we find it in the Septuagint and the New Testament, was called Hellenistic Greek. The literary spirit also migrated to Alexandria, which became for a time the home of the principal Greek culture, and nurtured the genius of Theocritus, the first of pastoral poets, the taste and erudition of Aratus and Apollonius Rhodius, and the research of Aristarchus and other eminent Homeric critics.

The period of somewhat less than two centuries (323–146 B.C.) which intervened between the death of Alexander and the conquest of Greece by the Romans was a sort of twilight between liberty and subjection.

At length the constant danger to which their liberties were exposed suggested the necessity of some kind of combination on the part of the separate states, and the famous Achæan league arose (280 B.C.), which revived the dying energies of the Greeks, and has thrown a luster over their period of decline.

From the time of the Roman conquest the existence of Greece was merged in that of greater political unity, so that for the next four centuries, until the commencement of the barbarian inroads, it can hardly be said to have a history of its own.

It was a part of the Roman policy, in dealing with conquered countries, to treat them at first with mildness, until they became inured to the yoke, and when this was the case, and precautionary measures had been adopted to prevent the possibility of successful revolt, to deal with them more harshly and increase their burdens. This was what happened in the case of Greece. The government never paid attention to the provinces for their own sake, but regarded them as an instrument for maintaining the greatness and power of Rome. The immense sums that were drained from them never returned, but were expended in the maintenance of the Roman army, and in the public games and architectural embellishment of the metropolis. Objects of local usefulness, such as roads, ports and aqueducts, received no attention from the central authorities, and no money was supplied toward their maintenance. Within a century also, when these evils were beginning to make themselves felt, the Roman rule became very oppressive.

The period, however, during which the greatest injury was inflicted on Greece was that of the Mithradatic War, (86 B.C.) At the commencement of that struggle many of the leading men and states declared in favor of Mithradates, thinking that under his auspices they might regain their freedom. But the appearance of Sulla with an army soon undeceived them, and they laid down their arms, with the exception of Athens, which was only reduced after an obstinate defense. When the city was at last taken by storm, the majority of the citizens were put to the sword, their possessions seized by the soldiers, the Piræus utterly destroyed, and Attica ravaged. In the same campaign Delphi and the other principal shrines were plundered, and an immense amount of property was ruined throughout the country.

Great injury was also inflicted by the Cilician pirates. The confined seas and numerous bays and islands of Greece have always been favorable to piracy, and at this time the evil reached such a height that the welfare of the state was threatened, and Pompey was intrusted with the office of eradicating it; but before this was accomplished many of the wealthiest cities in Greece and Asia Minor had been attacked and pillaged. With the accession of Augustus a brighter era seemed to have dawned; and under the early emperors, who desired to strengthen themselves against the senate, the interests of the provincials were more considered. Greater regularity also was introduced into the taxation, by the land and capitation taxes being regulated by a periodical census. But the old evils to a great extent remained, and these were further aggravated at a later time by the depreciation of the coinage, which proceeded with fearful rapidity, and caused widespread distress among the commercial and laboring classes.

The result of these changes is traceable in the condition and character of the Greek people. The conquests of Alexander the Great suddenly threw into circulation the accumulated treasures of the Persian empire, and a great part of these passed into the hands of the Greeks, both in Asia and Europe. The facilities thus created for obtaining wealth increased the material prosperity of the Greek race at large, so that in all probability it never was more numerous than during the period immediately preceding its subjugation by the Romans. Though all calculations respecting the numbers of the population in ancient states are necessarily hazardous, yet it seems probable that the Greeks at that time may have amounted to more than seven millions. But with Greece proper the case was different. There the increase of wealth raised the standard of living considerably above what it had been in earlier and more frugal times, so that the less moneyed class were tempted to emigrate in large numbers to seek their fortunes in the great Asiatic cities, and in the service of the Eastern monarchs, where so great openings presented themselves. The decrease of this class produced a larger accumulation of property in the hands of large owners, and greatly augmented the number of slaves. The depopulation of Greece continued; but while in this way the power of the nation was being weakened, and its material resources diminished by the loss of much of the capital that had been invested in the improvement of the country, the actual condition of the inhabitants was for the time improved, because the decrease in their numbers had been more rapid than the destruction of property. Possessing the necessities of life in abundance, and having but little money to spend on anything beyond, they sank into that condition of indifference and ease in which at last the barbarian nations found them.

The love of art still prevailed among them, and the quiet, studious life of the Greek cities formed, in the eyes of many, a favorable contrast to the violent struggles and inordinate passions of Rome. But the disbelief in the national religion which had grown up among the educated classes, notwithstanding the maintenance of the temples and their worship, tended to cause a separation between the upper and lower grades of society, and this, together with the isolation produced by the great size of the estates, which withdrew individuals from the scrutiny of their fellow citizens, weakened the force of public opinion, and thus lowered the moral standard. Thus, during a period of six centuries, the European Greeks had gradually degenerated, though, for the most part, from causes external to themselves; they seemed to have become an insignificant and almost commonplace people. It remained to be shown that

the finer qualities and more vigorous elements were only dormant, and this was brought to light in the latter half of the third century by two influences, which we must now proceed to explain.

The first of these was the invasions of the Goths. These were the earliest of the barbarians to break through the Roman frontier, and the defeat and death of the emperor Decius in Mœsia (251 A.D.), and the subsequent incursions of the Goths into Thrace and Macedonia, warned the Greeks of the peril that impended over them. Immediately the walls of Athens were repaired, the fortifications across the isthmus of Corinth restored, and vigorous preparations made for defense. The invaders soon made their appearance, both by land and sea, and one division, landing at the Piræus, succeeded in carrying Athens by storm; but an Athenian of rank, called Dexippus, afterward the historian of these events, succeeded in assembling a sufficient force to compel them to retire. This reverse was the prelude to their total overthrow, for succors were meanwhile arriving from Italy, by which their separate bands were attacked in detail and destroyed. Some years later, after other inroads, during which many cities of Greece successfully defended themselves, the power of the Goths was broken by the emperor Claudius II. at the great battle of Naissus, (269 A.D.)

The other and far more important influence which regenerated the Greeks at this time was Christianity. This religion, which had long been working in secret, though in ways which it is almost impossible to trace, now began to produce a marked impression on Greek society. Its power was the greater because it had worked from below upward, and had permeated to a great extent the lower and middle classes. It improved the moral condition of the Greeks by elevating their views of life, by quickening the conscience, and by infusing earnestness into the character; and it renovated their social condition by pointing out to them their duties to one another, by encouraging corporate feeling, and in particular by purifying the domestic relations through its influence on the female sex.

The scene now changes, and from the land of Hellas our attention is transferred to the city of Constantinople.

The principal events of the first half of this period, the two centuries which intervened between Constantine and Justinian, are—the foundation of Constantinople (330 A.D.); the emperor Julian's attempted restoration of Paganism (361); the defeat of Valens by the Goths near Adrianople, and his death (378); the establishment of Christianity by Theodosius the Great as the religion of the empire (388); the partition of the Roman empire between Arcadius and Honorius (395); the publication of the Theodosian code (438); and the extinction of the empire of the West (476). The reign of Justinian (527-565) comprises the great campaigns of Belisarius and Narses, whereby the kingdom of the Vandals in Africa was overthrown, and Sicily, Italy, and southern Spain were recovered to the Roman empire, the Greek possessions in Italy being henceforth governed by an exarch, who resided at Ravenna; the building of the church of St. Sophia at Constantinople; and the reformation of the Roman law. Finally, in the century and a half between Justinian's death and the accession of Leo III., occurred the birth of Mahomet (571); the victorious expeditions of Heraclius against the Persians (622-8); and the seven-years' siege of Constantinople by the Saracens in the reign of Constantine Pogonatus (668-675).

The reforms effected by Constantine formed one of the greatest revolutions the world has ever seen, and his sagacity is shown by the completeness with which

they were carried out, and by the permanence of their effects, for from them proceeded both the strength and the injuriousness of the Byzantine system, which lasted even to the latest days of the empire. To describe them in brief,—he centralized the executive power in the empire, and constituted a beaurocracy for the administration of public business; he consolidated the dispensation of justice throughout his deminions; he rendered the military power, which had hitherto been the terror and bane of the state, subservient to the civil power; he adopted a new religion, and established a new capital. Henceforth the world was ruled by the emperor and his household, and this administration was wholly irresponsible; and as the interests of the government were unconnected with those of any nationality and any class of its subjects, there was sure to be a continual struggle between the rulers and those whom they governed.

We must not overlook the strong points of Constantine's system. The first of these was the regular administration of justice which he introduced. This the inhabitants of the empire felt they could not obtain elsewhere, and the possession of it reconciled them to many otherwise intolerable grievances. So conscious were succeeding emperors of this that we find strictness observed in this matter until quite a late age of the Byzantine empire. Another was the amount of ability and experience which it secured for the public service. Each department of the state formed a profession of itself, as completely subdivided, and requiring as special an education as the legal profession at the present day. The perfection of this machinery accounts for the empire not having fallen to pieces in times of internal dissension, sometimes accompanied by foreign invasion; and the facilities afforded for developing talent are seen in the long succession of able administrators which the system produced, and which came to an end at the commencement of the eleventh century, when it began to be disused.

The choice of the site of New Rome—which is perhaps the finest position in the world, as it commands the meeting point of two great seas and two continents, and rises in seven hills on its triangular promontory between the Propontis and its land-locked harbor the Golden Horn—is an additional proof of the penetration of Constantine; and the event justified his selection, for on numerous occasions nothing else than the impregnability of the seat of government could have saved the empire from destruction. Though the establishment of a new capital was in itself a consummate stroke of genius, yet to some extent it was forced upon the emperor by his conversion to Christianity, for this placed him in direct antagonism to Old Rome, which was still the headquarters of paganism. The new city at the time of its foundation was Roman: its senators were transported thither from Rome; the language of the court was Latin; and the condition of the lower classes was assimilated to that of the old capital by their being exempted from taxation and supported by distributions of grain. But from the first it was destined to become Greek; for the Greeks, who now began to call themselves Romans, an appellation which they have ever since retained, held fast to their language, manners, and prejudices, while they availed themselves to the full of their rights as Roman citizens. Hence, in Justinian's time, we find all the highest offices in the hands of Greeks—not Hellenic Greeks, but a Græco-Roman caste, the descendants of the Macedonian conquerors of Asia; and Greek was the prevailing language. The turning-point in this respect was the separation of the East and West in the time of Arcadius and Honorius.

Whether the conversion of Constantine to Christianity was due to sincere belief or to policy, or, as is perhaps most likely, to a combination of the two motives, there can be no doubt that religion had before that time obtained a great influence over the Greeks, and that the cause of the Christian Church and that of the Greek nation were already closely interwoven. Nothing could show more clearly the mastery obtained by the new faith than the subsequent failure of the Emperor Julian to revive paganism. But the orthodoxy of the Eastern Church, which came to be, and still is, its most distinctive feature, and the identification of the Orthodox Church with the Greek nation, date from a different time, viz., from the reigns of the Arian successors of Constantine, to whose personal opinions the people were strongly opposed. The political effect of this union ultimately became very great, and resulted in the loss of important provinces to the empire.

The reign of Justinian, which, from the important events which it contained, has naturally much attracted the notice of historians, was a period of false brilliancy. The character of that emperor in many respects resembles that of Louis XIV. Both were men of moderate ability, gifted with great industry and application to business, and with a remarkable power of employing the talents of others; both were fond of splendor and foreign conquest; and both impoverished and ruined their subjects. No doubt the conquests of his generals were splendid, and testify to the greatness of the armies of the empire at this time. No doubt also the compilation of the *Pandects*, *Code*, and *Institutes* was a magnificent work, which has left indelible traces on the legal systems of Europe. And it is an honor to any age to have developed the Byzantine style of architecture, a style thoroughly Greek in its unity and proportion. But the effects of his reign on his dominions were ruinous. He riveted tighter the fetters which Constantine had invented, but he lacked the penetration of Constantine in perceiving the needs of his time. He dissolved the provincial militia, which to some extent still existed in Greece. The population were ground down by taxation, the revenues of the free cities in Greece were seized, and at last the fortifications fell into disrepair, and a great part of the army was disbanded, so that when Zabergan, king of the Kutigur Huns, invaded the country from the north in the year 559, he was able to approach within seventeen miles of Constantinople.

The 400 years which elapsed between Constantine and Leo III. were the great period of the barbarian invasions. The Goths, who, as we have seen, had overrun Greece in the latter half of the third century after their great defeat at Naissus (Nisch), were more or less kept in check, and became in some degree a civilized and Christian people in the country of Dacia, to the north of the Danube, which they had permanently occupied after the Roman colonies in that country were withdrawn by Aurelian. But in the reign of Valens, when the Huns were overrunning Europe, they were pressed onward by these invaders, and occupied Mœsia between the Danube and the Balkan, which province was peacefully ceded to them. It was only in consequence of treacherous treatment by the Romans that they afterward entered the empire as enemies, and fought the campaign which ended in the defeat and death of that emperor (378). They were again checked by Theodosius, and persuaded to enlist in great numbers in the imperial service; but during the reign of his successor Arcadius, the famous Alaric roused the spirit of his countrymen, and ravaged the whole of Greece even to the Peloponnesus (395), before he turned his thought to the invasion of Italy. For a time both Goths and Romans were the victims of

Attila, who with his hordes of Huns swept over the lands south of the Danube (442-7), and was only induced to retire by an agreement on the part of Theodosius II. to pay him an annual tribute. But again, in the reign of Zeno (475), the empire was in imminent danger from the Goths under Theodoric, who, like Alaric, had lived at Constantinople, and like him also withdrew into Italy. Toward the beginning of the sixth century the Goths made way for more barbarous invaders, Bulgarians of Turanian origin, and various Slavonic tribes, for whose pastoral habits the now depopulated country was better suited than for a more civilized population. But they in turn were soon swallowed up by the Avars, whose vast monarchy occupied a great part of eastern Europe, and whose armies, in the time of Heraclius, threatened Constantinople itself. The Avar power disappeared as suddenly as it had risen, and at the end of the seventh century its place is taken by the Bulgarian kingdom, which lasted for nearly 350 years, and was the great antagonist of the Byzantine empire in its most flourishing period.

On the side of Asia, during the same period, a long struggle was maintained with Persia. The dynasty of the Sassanides, which arose on the ruins of the old Parthian kingdom, had raised that country to great power and prosperity. The second in order of its princes, Sapor I., had taken the emperor Valerian prisoner (257), and a century later Julian lost his life when fighting in Persia. The ill success of Justinian in his Persian wars ought fairly to be ascribed as much to the ability of his great opponent, Chosroes Nushirvan, as to his own shortcomings; but the fact remains that even Belisarius won small glory from those contests, and after a struggle of twenty years' duration, a treaty was concluded, which required the European monarch to pay an annual subsidy of thirty thousand pieces of gold. War, however, continued during the reigns of his successors, Justin II. and Tiberius II., until an honorable peace was concluded by Maurice, the son-in-law of the last-named emperor, at whose court Chosroes II., the rightful sovereign, had been received when he was an exile. But when Maurice was dethroned by the rebel Phocas, the Persian monarch declared war, professedly with the design of avenging his benefactor. The greater part of the Asiatic provinces were laid waste, and a Persian army was for a time encamped on the shores of the Bosphorus, so that it seemed as if the Roman empire was about to be conquered by Persia. From this it was saved by Heraclius, who was not only one of the ablest of the emperors, but one of the greatest of military leaders. He waded off the impending danger, and in seven campaigns by a series of brilliant victories, dealt a death blow to the Persian power.

We turn now to the condition of the Greeks during this period. In the interval between the first Gothic invasions and the accession of Constantine the material prosperity of Greece had increased, owing partly to the devastation of the provinces to the north of that country, the wealthy inhabitants of which were forced to take refuge in Greece, and partly to the insecurity of the Red Sea, Egypt and Syria, which caused the commerce of Central Asia to take the route of the Black Sea, whence the trade of the Mediterranean passed once more into the hands of the Greeks. The period of 120 years between the death of Arcadius and that emperor's accession was a time of improvement. During the long reign of Theodosius II. the power was in the hands of his sister, the philanthropic Pulcheria, and of his ministers, and these seem to have ruled judiciously; and the five succeeding emperors, Marcian, Leo. I., Zeno the Isaurian, Anastasius and Justin, were all men born in the middle or lower class of society, and of provincial origin, and had come to the throne at a

mature age. The sympathy which they thus had with the body of their subjects accounts for their economy, and for their endeavors to restore the resources of the empire and alleviate its burdens, and generally to introduce regular forms of procedure into public business. Far different was the case with Justinian, whose severe demands for money distressed all classes of his subjects. But it was on Athens that his hand was most heavily laid. That city was still a literary capital where Hellenic learning was cultivated; and if the *Hero and Leander* of Musæus and that graceful pastoral romance, *Daphnis and Chloë* of Longus, are to be assigned to so late a date as the fifth century, the spirit of the ancient literature had not long been extinct among the Greeks. The ancient buildings still existed in their splendor; the citizens lived a life of quiet, self-complacent ease; and the paganism, of which it was now the center, had been purified from its vices by the maxims of philosophy and the influence of Christianity. It remained for Justinian, in his merciless centralization, to close its schools and confiscate their revenues. At the same time the Olympian games were brought to an end. From this time onward the inhabitants of Hellas are but little heard of, and at the beginning of the eighth century we find them spoken of by Byzantine writers under the contemptuous title of *Helladii*, while the Greek nation is represented by the population of Constantinople and Asia Minor.

One result of the financial legislation of this time was a change which, though the lawgivers certainly did not foresee it, was most beneficial in its effects. This was the gradual extinction of slavery in the Eastern empire. The power that effected this was not Christianity, for that religion had recognized slavery as an institution, nor yet civilization, for that among the Greeks was intimately connected with the employment of slaves. It was rather produced by an alteration that was taking place in the condition of certain classes, which annihilated the distinction between the freeman and the slave. Many centuries elapsed before this change fully worked itself out. The slave trade was still an important branch of commerce in the Roman empire, and freemen were sold as slaves if they failed to pay their taxes; but henceforth the system was doomed to ultimate extinction.

It is important also to remark, now that we are approaching the period of change from ancient to modern society, that the decline of civilization in the later Roman empire was not owing to degeneration in the people themselves, or to an inevitable downward tendency in highly civilized communities. The forbidding to carry arms necessarily renders a people unwarlike. Where municipal institutions are discouraged, public opinion soon becomes powerless. When the resources which might be employed in constructing roads are withdrawn, communication ceases, and with it the interchange of ideas and other influences by which the intellect is quickened. The degradation was produced by the injustice of the Government, which pillaged its subjects, and systematically destroyed all independence among them. Whenever the iron hand was removed, they showed signs of renewed life and vigor, but the strength of the central power was too great to encourage any hope of resisting it successfully. They had no choice but to sit down under it, and suffer it to drain their life-blood by slow degrees.

At the commencement of the eighth century the extinction of the empire of the East appeared to be imminent. The same causes which had overthrown the Western empire were threatening it with destruction. The Saracens had overrun all its Asiatic possessions, and had attacked the capital itself, while in Europe it

was threatened by the Bulgarians. The provinces were falling off: Syria, Egypt, Africa, and the conquered provinces of Spain were wholly lost, and in Italy the dominions of the exarchate were greatly circumscribed by the Lombards. At home rebellion prevailed in the army, and anarchy in the government, six emperors having been dethroned within the space of twenty-one years. It seemed as if the Greek race itself would be destroyed; in the countries conquered by the Saracens the Greeks were almost exterminated, and Greek civilization proscribed, while Hellas was threatened with occupation by the barbarians. But at this moment the helm of the state was seized by a man who, by his force of character and his great abilities, inaugurated a new state of things, and gave the empire a new lease of life. This man was Leo the Isaurian.

Considerable difference of opinion has existed as to the precise time at which the Roman empire of the East may be said to have ended, and the Byzantine empire to have commenced. Gibbon remarks that "Tiberius by the Arabs, and Maurice by the Italians, are distinguished as the first of the Greek Cæsars, as the founders of a new dynasty and empire."

We must first notice the reforms which caused the reign of Leo III. to be an era in the history of the empire. These extended to almost every branch of the administration. In respect of the army, he reorganized the military establishment by placing the various bodies of soldiers in the different "themes," or departments, each with a general of its own, thereby providing for local defense, and avoiding the danger of rendering the military commanders too influential—a system which defended the empire for five centuries. The geographical arrangement in themes was introduced by Heraclius, but reorganized by Leo, and bore somewhat the same relation to the previous division into provinces that the departments in France bear to the earlier distribution of that country. In respect of finance, he brought the taxation immediately under the emperor's cognizance, so that thenceforth the emperors were their own finance ministers. All local agencies for collecting the taxes were abolished, and their functions transferred to the imperial officers, who took census regularly. By this means he raised more money than his predecessors, but the increased prosperity of the people showed that the burden did not fall so heavily. In respect of justice, in order to obviate the difficulties which had arisen in the administration of Justinian's elaborate laws, especially since the facilities for communication throughout the empire had decreased, he published in Greek an abridged manual called the *Ecloga*, and codified the military, agricultural and maritime laws. In respect of religion, he aimed at counteracting the element of superstition which had crept into the church, and through it was corrupting the public mind. But this last point calls for separate consideration, since the worship or prohibition of images became the burning question of the age.

The history of iconoclasm is the history of Constantinople during the eighth century and the first half of the ninth, and involved a great part of the empire in its distractions. There can be little doubt that, in his opposition to image worship, Leo represented the opinion of a large part of the enlightened laymen of his time, while the great body of the clergy, but especially the monks, together with the mass of the population, were passionately attached to the statues and pictures, as objects of reverence, not to say of adoration. But the fact that the stronghold of iconoclasm was Asia Minor, and especially that part of it which bordered on the countries occupied by the Saracens, suggests that it was in part owing to the spread of Mahometanism, the rig-

idly guarded spirituality of which creed was a standing protest against more material conceptions of religion. The emperors of this time were those of the Isaurian, Armenian, and Amorion dynasties, all which names remind us that they came from the Asiatic provinces; whereas the great restorer of images the empress Irene, during whose regency the second council of Nicea in their favor was held (787 A.D.), was an Athenian. But the matter was complicated by a further issue; the question of images was closely connected in the minds of the emperors, and especially of Leo. III. and his hard-handed son Constantine Copronymus, with that of their supremacy in matters of religion. They viewed with jealousy the independent power of the church, and were glad of the opportunity this controversy afforded of strengthening their control over this department, and claiming to the full those ecclesiastical rights which, from the time of Constantine the Great onward, had attached to the imperial authority. As this move was only part of a system of centralization, the monks and others who supported image worship were from one point of view the asserters of liberty against aggression, and they were recognized as such by a certain number of thinking men, who watched with anxiety the growth of despotism. As toleration was unknown to the age, persecution was carried on by both sides with equal fierceness, and the contest swayed to and fro, until it was brought to an end by the final restoration of images under Michael III., the last of the Amorion line (842). Its effects on society had been remarkable. At first its influence was bracing, as was shown by the renewed vigor which pervaded the empire; for both sides were thoroughly in earnest, and among the iconoclasts in particular an element of Puritan energy was evolved. But in its later stages, when the people at large were weary of the strife, and the struggle was felt to be in reality one between church and state, the prevalent hypocrisy generated disrespect for religion, and this was followed by general immorality. It further caused the loss to the empire of its dominions in central Italy. So great was the alienation produced by this movement in the minds of the popes Gregory II. and III. that thenceforward the holy see was for the most part either active in its opposition to the Byzantine power or lukewarm in support of it. At last, in 751, Ravenna was captured by the Lombards, and the Greek exarch retired to Naples.

The history of Greece from the fall of Constantinople to the present day suggests a problem of profound historic interest. From the year 1453 till the end of the eighteenth century almost all the occasions on which the Greek people appear on the page of the historian are occasions on which we read of them that they were butchered or sold into slavery. Records tell only of their annihilation or dispersion. Yet in the commencement of the nineteenth century this apparently annihilated and dispersed people could summon energy enough to resist the Turks, and although in all probability they would have failed to overcome their oppressors if they had been compelled to struggle unaided, yet the courage and self-devotion which they showed in the conflict were such as to gain for them the sympathies of Europe, and they came forth triumphant. But in reading even of their war for independence we are astonished that a remnant was left. Thousands upon thousands perished, and their victory seemed only less terrible than utter defeat. Yet the spirit of life remained. The kingdom of Greece was established, and within forty years, notwithstanding deplorable mistakes in its management, the population is doubled and the country becomes consolidated into a constitutional realm. To trace how these events were possible and

how they actually came to pass is the task of the historian of Modern Greece.

The external events in this history are necessarily few. Greece was during the most of these centuries under the sway of foreigners, and the external history of Greece is formed merely by episodes in the history of these foreigners. When Mahomet II. became master of Constantinople, he did not thereby become master of the Greek empire. The Paleologi had held only a small portion of the territory which had constituted the Greek empire. Most of the islands of the Ægean were under the rule of Italian princes who acted as independent rulers. Rhodes was governed by the knights of St. John. But especially the Venetians owned large possessions in Greece and were also powerful by sea. The external history of Greece is occupied mainly with the efforts of Mahomet II. and his successors to spread their conquests. Mahomet himself conquered the kingdoms of Trebizond, Albania, Eubœa, Greece proper, and part of the Peloponnesus. He was also successful in expeditions against several of the islands of the Ægean, but he failed in his attack on Rhodes. It was not till the end of 1522 that the knights of St. John capitulated to Suleiman I. after standing a siege in which they showed the greatest bravery, and in which the Ottomans, it is said, lost about 100,000 men. On the 1st of January the knights left the island, to go first to Crete and then to Malta. Cyprus and Crete remained still longer in the hands of the Westerns. In 1489 Catherine Cornara ceded the island of Cyprus to the Venetians, who retained possession of it till, in 1570, Piali and Lala Mustapha attacked it. Nikosia fell in September, 1570, and Famagosta in August, 1571, after a brave defense conducted by Marcantonio Bragadino. The Turks received a severe defeat at Lepanto from Don Juan d'Austria in command of the combined fleets of Spain and Italy, in which they lost 130 ships and 30,000 men. But the blow was merely temporary. The helpers of Venice were not united among themselves. Again the Turks became the rulers of the Ægean Sea, and in 1573 Venice had to conclude a humiliating treaty in which she gave up Cyprus. In the case of Crete Venice had to pay for her own severity. That island remained for a long time undisturbed in possession of the queen of the seas, as far as the Ottomans were concerned. But internal commotions agitated it. The Sphakiots or mountaineers of the southwest of Crete—a bold, brave, and independent race of men—rebelled against the rule of the Westerns; and the Venetians had recourse to the most shameful cruelties and atrocities on all their Greek subjects in order to crush the rebellious spirit. The result was that the Greeks hated the Venetians with the bitterest hatred, and would have gladly welcomed a change to the rule of the Turks. The Venetians saw that they had gone too far, and sent a wise politician, Giacomo Foscarini, to bring matters to a better state. Many prudent reforms were inaugurated, the Sphakiots were reconciled, and all seemed to promise well. But Foscarini died before his reforms got firm hold of the people. The Sphakiots, indeed, from that day to this have never submitted to the Turkish yoke, but the rest of the people were far from willing subjects of the Venetians, and favored an invasion by the Turks. The Turks knew their opportunity, and began an effort to possess the island which, though the Venetians resisted with great perseverance and were backed by other Italians and by the French, ended in the treaty of September 6, 1669, in which they ceded Crete to the Turks. This last acquisition rendered the whole of Greece subject to the Turks with the exception of the Ionian and a few other small islands, which still remained in the hands of the Venetians. The Vene-

tians, however, did not resign their hold on Greece without a final effort to recover possession of it. For this purpose they not only levied soldiers from their own and other Italian communities, but also hired generals and soldiers from Germany. The war began in 1689. The management of it was intrusted to one of the greatest men whom Venice produced, Francesco Morosini, who was ably assisted by a Swedish general, Königsmark. The contest was carried on with great vigor until at length the Turks were driven from the Peloponnesus. The war was brought to an end by the peace of Carlowitz, which left Venice in possession of the Peloponnesus, and the islands of Ægina and Santa Maura. One incident in this war has especially attracted the attention of the civilized world. Morosini, finding his efforts successful in Morea, resolved to advance toward Eubœa. Athens lay in his way. It was garrisoned by the Turks, who, however, on his approach quitted the lower city, and, occupying the Acropolis, prepared to defend it at all hazards. They planted one of their batteries in a breach of the temple of Nike Apteros, and they placed a portion of their powder and many of their valuables in the Parthenon. The Venetians showed no respect for the most beautiful of all buildings; and one of their bombs, falling on the powder in the Parthenon, blew many of the masterpieces of art into a thousand fragments, and utterly defaced the noble building which had remained up till that time very nearly in the condition in which the original architect and sculptor had left it. The Venetians tried to introduce reforms into the Peloponnesus, and had made considerable progress when in 1715 Ali Kumurgi, at the head of a very large Ottoman army, entered the Peloponnesus. The Venetians were unprepared, and they could not easily get assistance from others. The consequence was that in a very short time Kumurgi drove them out of the whole of the peninsula. The Turks got involved at this time in war with Austria; and when peace was finally concluded at Passarowitz, Venice had to give up Morea as well as the island of Ægina, and practically disappears from the history of Greece except as the possessor of Santa Maura. But a great change had now begun to take place in European politics. At an early period after the capture of Constantinople the Turks came into collision with their neighbors on the north, the empires of Austria and Russia, and we find these two powers united in resisting the inroads of the Ottomans. Even so late as 1683 the Turks were so bold as to advance as far as Vienna and lay siege to it. But in the eighteenth century the policy of Russia attracted the attention of the rest of Europe, and caused a considerable change of attitude. Early in that century Peter the Great had declared his resolution to force his way into Constantinople, and though he was completely balked in his aim, and had to sign an inglorious peace (1711), the desire to have the city on the Bosphorus continued to animate the Russians. It is to Count Münich, field-marshal and counselor of the Russian empress Anna, that historians attribute the suggestion that Russia should systematically stir up the Greek Christians against their Turkish masters, and from this time (1736) onward we find Russia continually scheming to rouse the Greeks to insurrection. Most famous among these efforts were those of the empress Catharine II., who influenced partly by the Philhellenism of Voltaire, partly by a desire to withdraw the attention of her subjects from domestic affairs, but principally by a wish to gratify her favorite Orloff, formed the project of emancipating the Greeks from the yoke of the Turks (1769). But all the efforts made to effect this object were exceedingly inadequate. The Russians were more successful in their contests with the

Turks in the north, and in 1774 compelled the sultan to accept a peace, called the peace of Kainardji, which contained several provisions bearing upon the Greeks. In some of these the sultan promised to protect the Christian religion and Christian churches, and though no special mention was made of Russia, her statesmen saw in this stipulation an opening for endless opportunities to interfere. And from this time forward Russia has claimed to be the champion of the Christians against the Turks. But the other states of Europe, especially France and England, became suspicious of the designs of Russia, and holding to the balance of power as an essential principle of European statesmanship, they determined to maintain the integrity of the Turkish empire. Austria had frequently joined with Russia in opposing the Turks, and had again and again hoped to come in for a share of the spoil when Turkey should be partitioned. But toward the end of the eighteenth century the increasing power and influence of Russia began to alarm her, and when the Greeks rose to assert their independence, no power more tenaciously adhered to the doctrine that the integrity of the Turkish empire was demanded by the balance of power in Europe.

The notable fact in Greek history during these ages is the disappearance and the apparent destruction of the nation. Whoever might hold the supreme power in Greece, the Greeks were sure to be the sufferers. When the Turks spread their conquests from Constantinople on to the rest of the empire, every capture of a city was followed by the slaughter of the able-bodied men and the carrying off of the women and children to the harem or slave market. And the Western Christians were not a whit more tender than the Ottomans. The Venetians were wroth with the Greeks because they did not acknowledge the pope, and in the island of Crete perpetrated the most abominable barbarities on the innocent population. The Turks punished the Greeks because they submitted to the Venetians, and the Venetians punished them because they submitted to the Turks. Moreover, in these times the Ægean was infested by pirates who, whether Turks or Italians or Greeks, had no mercy on the peaceful inhabitants of the mainland. Human life was disregarded, and men and women were of value only in so far as they were salable articles in the slave market. We have to add to this record of destruction that vast masses of the people removed to Italy or Sicily or some other place of refuge. Almost all the famous families that ruled the islands of the Ægean escaped from them when they were attacked by the Turks. The knights of St. John, for instance, left Rhodes to find a final settlement in Malta. Among the number who thus left their native land were nearly all the learned men, who sought in the West a refuge from Turkish rule, and opportunities for the pursuit of learning.

The great bond of sympathy which attached the various Greeks together during the sixteenth and seventeenth centuries was their religion. But a new inspiration came with the advance of culture in the end of the eighteenth and the beginning of the nineteenth century. They began to be animated by the feeling of nationality. The French Revolution roused their minds into activity, and they were ashamed that a nation which had played such a grand part in the early civilization of mankind should be the slaves of an illiterate and barbarous horde of aliens. Circumstances favored the movement. Especially prominent amongst these was the conduct of Ali Pasha, the tyrant of Jannina. This daring and unscrupulous despot conceived the idea of cutting his connection with the sultan and assuming the absolute government of Albania. His effort showed how weak the Turkish empire was, and how loosely it held

together. Stimulating also was the conduct of the Suliotes, who performed prodigies of valor in their resolution to defend their homes and their liberties. A secret society was formed to make ready for a rising of the people. The people were stimulated by patriotic songs, especially those of Rhigas of Velestino; and the agents of Russia were everywhere.

Accordingly in 1821 the war for independence broke out. It would be impossible in the limits of an article like this to give a proper account of the various conflicts between Greeks and Turks, of the quarrels among the Greeks themselves, and the windings of European diplomacy in its interference in the contest. The principal events may be shortly noted. The insurrection was begun by Prince Alexander Hypsilantes, a Phanariot in the service of Russia, who had been elected head of the chief secret society. He crossed the Pruth March 6, 1821, with a few followers, and was soon joined by several men of great bravery at the head of considerable troops. But the expedition was badly managed, and in June Hypsilantes fled to Austria, having entirely failed in his object. And in all the efforts to overthrow the power of the Turks in the northern provinces the Greeks failed, though some men fought very bravely. In the Peloponnesus the insurrection broke out also in March in several places, and most prominent among the first movers was Germanos, archbishop of Patras. Everywhere the Greeks drove the Turks before them; they were so successful that in January, 1822, the independence of Greece was proclaimed. Prominent among the Greek patriots was Marco Bozzaris, who waged an uncompromising war with the Turks from 1820 to 1823, being killed at Mesolonghi in the latter year. But they soon began to quarrel among themselves. Several assemblies were held. Mavrocordatos, one of the Phanariots, was appointed president. But the aspirants for honors and rewards were numberless, and they could not agree. Accordingly a civil war raged in 1823 and 1824, inspired by Colocotronis, a chief of klephts who attained great influence, and in 1824 another civil war of short duration, called the war of the Primates. During this period the Greek fleet was very active, and did good service. It was ably led by Miaoulis, a man of firm character and great skill. And he was well seconded by the intrepid Canaris, whose fire ships did immense damage to the Turkish fleet, and filled the Turkish sailors with indescribable terror. For the ravages of the Greek fleet the Turks wreaked fearful vengeance on the innocent inhabitants of the lovely island of Ghios (April, 1822), butchering in cold blood multitudes of its peaceful inhabitants, and carrying off others to the slave market. The savage atrocities then perpetrated caused a thrill of horror throughout the civilized world. Two years after they perpetrated similar outrages on the islands of Kasos and Psara. The sultan now invoked the aid of Mehemet Ali, pasha of Egypt, and his stepson Ibrahim landed on the Peloponnesus with a band of well-disciplined Arabs in 1824. Ibrahim carried everything before him, and the Greeks lost nearly every place that they had acquired. Some towns offered a strong resistance, and especially famous is the siege of Mesolonghi, which lasted from April 27, 1825, to April 22, 1826. Nothing could exceed the firmness and bravery displayed by Greek men and women during that siege; and their glorious deeds and sad fate attracted the attention of all Europe. The interest in the Greeks, which had been to some extent aroused by Lord Byron and other English Philhellenes in 1823, now became intense, and volunteers appeared from France and Germany, as well as from England and America. Lord Cochrane was appointed admiral of the Greek fleet, and Sir Richard Church generalissimo of the land forces,

but they did not prevent the capture of Athens by the Turks, June 2, 1827. Most of the European governments had remained indifferent, or had actually discouraged the outbreak of the Greeks. Russia had disowned Hyspilantes. The monarchs of Europe were afraid that the rising of the Greeks was only another eruption of democratic feeling fostered by the French revolution, and thought that it ought to be suppressed. But the vast masses of the people were now interested, and demanded from their governments a more liberal treatment of Greece. Canning inaugurated in 1823, and now carried out this new policy in England. An accident came to the aid of the Greeks. The fleets of England, France and Russia were cruising about the coasts of the Peloponnese, to prevent the Turkish fleet ravaging the Greek islands or mainland. Winter coming on, the admirals thought it more prudent to anchor in the Bay of Navarino, where the Turkish fleet lay. The Turks regarded their approach as prompted by hostile feelings and commenced firing on them, whereupon a general engagement ensued, in which the Turkish fleet was annihilated, October 20, 1827. Shortly after (January 18, 1828) Capodistrias, who had been in the service of Russia, was appointed president of Greece for seven years, the French cleared the Morea of hostile Turks, and Greece was practically independent. But several years had to elapse ere affairs reached a settled condition. Capodistrias was Russian in his idea of government, and, ruling with a high hand, gave great offense to the masses of the people; and his rule came to an untimely end by his assassination on October 9, 1831. Anarchy followed, but at length Otho of Bavaria was made king, and the protecting powers signed a convention by which the present limits were definitely assigned to the new kingdom (1832). Henceforth Greece has existed as a recognized independent kingdom. Throughout the whole of the war of independence in Greece, the people behaved with great bravery and self-sacrifice. They showed a steady adherence to the idea of liberty. They were sometimes savage in their conduct to the Turks, and barbarities occurred which stain their history. But no single man arose during the period capable of being in all respects a worthy leader. Nor can this be wondered at. All the men who took a prominent part in the movements had received their training in schools where constitutionalism was the last doctrine that was likely to be impressed on them. It could not be expected that such men would act with great mercy or prudence in dealing with Turks who had butchered or enslaved their kinsmen and kinswomen for generations. Even among the foreigners who volunteered to aid the Greeks, few, if any, were found of supreme ability, and after the kingdom was established the Greeks were unfortunate in the strangers who came to direct them. Otho had been brought up in a despotic court, and knew no other method of ruling. He brought along with him Bavarians, to whom he intrusted the entire power, and the Greeks had the mortification of knowing that, though their kingdom was independent, no Greek had a chance of being elevated to any ministerial office of importance. Accordingly, a revolution broke out in 1843; the Bavarians were dismissed, and Otho agreed to rule through responsible ministers and a representative assembly. But he failed to fulfill his promise. Discontent reached its height in 1862, when another revolution broke out and Otho had to leave Greece. The great mass of the people longed for a constitutional monarchy, and gave a striking proof of this by electing Prince Alfred king of Greece. The choice was determined by universal suffrage, and out of 241,202 Greek citizens who voted, 230,016 recorded their votes in favor of the English prince. The vote meant simply that the Greek people

were tired of unconstitutional princes, and hoped that they would end their troubles if they had a prince accustomed to see parliamentary government respected and enforced. The three protecting powers—England, France and Russia—had, however, bound themselves to allow no one related to their own ruling families to become king of Greece. When the Greek people received this news, they begged England to name a king, and after several refusals England found one in Prince William of Schleswig-Holstein, son of the king of Denmark. The Greek people accepted him, and in 1863 he became king with the name of George I. Britain added the Ionian islands to his kingdom. In 1875 the ministry gave great offense to the Greek people by its unconstitutional procedure, but the king persisted in standing by it. The people, however, persevered in the use of legitimate means to oust the ministry; the king at last prudently yielded, and thus a revolution was prevented. The effort of the Greeks to extend their boundaries is the last phase of their history, and is still in progress. In 1853, when the Crimean war broke out, the Greeks sided with the Russians, and in 1854 they made inroads into Thessaly and Epirus, but English and French troops landed at the Piræus, and forcibly put an end to the Russian alliance and to Greek ideas of acquiring additional territory. In 1866 to 1869 the Cretans struggled bravely, but unsuccessfully, to throw off the Turkish yoke and become a part of the Greek kingdom. More recently, when the Russians made war on the Turks, the Greeks were eager to enter Thessaly and Epirus to aid their fellow-countrymen in asserting their freedom. But England interfered with the promise that Greece would gain more by maintaining a peaceful attitude. A clause in the Berlin Treaty afforded a basis for the fulfillment of this promise; and in 1881 Thessaly and Epirus were ceded to Greece by Turkey, which yielded to pressure from the great powers. The Greeks themselves believe that with the extension of their boundaries there will be less occasion for intrigue, ministries will be more permanent, and the Greeks who now flock from all parts to the little kingdom of Greece for official employment will have a wider sphere and will be more contented.

The population of Greece, according to the latest statistics, is upward of 1,900,000; that of Athens in 1889 amounted to 107,746. The national debt at the same period was 556,645,046 drachmas. During 1888 the aggregate value of imports and exports was 204,803,000 drachmas; 5,976 vessels entered and 5,462 vessels cleared Greek ports, the Greek merchantmen giving employment to 21,591 sailors. There are 8,100 kilometers of telegraph lines in operation, and considerable progress has been made in the construction of railroads. In 1889 the army consisted of 26,113 men rank and file, and the navy of 2,945 men.

GREEK LANGUAGE AND LITERATURE.

The possession of a common language was always regarded by the Greeks themselves as the most significant and important of the bonds which united the scattered members of the Hellenic nationality. Wherever there was a community speaking the Greek tongue, whether in Europe, Asia or Africa, from Olbia on the Hypanis to Cyrene in Libya, from Salamis in Cyprus to Malaca near the Pillars of Hercules, there was a portion of the Hellenic people linked to the rest by mutual intelligibility, and sharply marked off from the jabbering and inarticulate *barbarians* who surrounded them. The earliest written records of this speech are probably to be found in what was at the same time the most precious common possession of this great nationality, the poems that bear the name of Homer. It is possible indeed that, in the form in which they have come down to us,

they are later than the fragments of the earliest elegiac and iambic poets, such as Callinus, Mimnermus, Archilochus and Simonides of Amorgus; but it cannot be doubted that in substance they go back to an earlier date. These, however, are in a literary language—a language which bears the most evident marks of a free combination for artistic purposes of various popular dialects, along with many reminiscences of archaic forms and usages, and not a few formations due only to false analogy. For the early history of the Greek language we are obliged to have recourse to the reconstructions of linguistic science.

Comparative philology shows us that there was a time when the ancestors of the various nations which speak what are generally known as Indo-Germanic languages lived together and had a common speech. From the extent and character of the agreement between these various languages at the time when they first become known to us from written records, it is possible to a certain extent to determine which groups remained the longest in connection with each other, and which parted off the soonest from the common stock. Unfortunately scholars are as yet by no means at one as to the results to which this method of inquiry leads us. Schleicher, *e.g.*, held that the agreement between the Aryan or Asiatic group of languages and the South-European (in which he includes not only Greek and Italian, but also Celtic) is closer and more significant than that between the latter and the North-European, *i.e.*, the Teutonic and the Letto-Slavonic group. Max Müller and Joh. Schmidt maintain that the relations of the various languages are so complicated that it is impossible to establish any "genealogical tree," or to determine the order in which they separated from each other. But the prevailing view is still that of Lottner, Curtius, Jolly, Fick and Scherer, that we may with confidence assume the first division to have been that between the Aryan or Asiatic (Indo-Persian) and the European groups, and that there are sufficient points of agreement between all the European languages to warrant us in assuming that there was a period of some duration during which the European peoples remained united.

At the time when the common Indo-European unity was first broken up, the language had reached a stage of development which may be given with some confidence as follows: The steps assumed are those which have been established by Professor Curtius in his monograph. In spite of the criticisms to which this scheme has been subjected, by far the most important of which are those by Max Müller and Ascoli, it may fairly be said to maintain its ground, and it is reassured with full confidence in Curtius' admirable work on the Greek verb.

The history of Greek literature has had three great stages—the Old Literature, from the earliest times to 529 A.D., when the edict of Justinian closed the schools of pagan philosophy; the Byzantine Literature, from 529 A.D. to the taking of Constantinople by the Turks in 1453; and the Modern Literature, which may be said to have begun with the satirical poetry of Theodorus Prodromus in the twelfth century.

The Old Literature, to 529 A.D., falls into three periods. I. *The Early Literature*, to about 475 B.C. Epic, elegiac, iambic, and lyric poetry; the beginnings of literary prose. II. *The Attic Literature*, 475–300 B.C. Tragic and comic drama; historical, oratorical, and philosophical prose. III. *The Literature of the Decadence*, 300 B.C. to 529 A.D.,—which may again be divided into (1) the Alexandrian period, 300–146 B.C., and (2) the Græco-Roman period, 146 B.C. to 529 A.D.

It is not the purpose of the present article to enter

into details regarding particular works or the lives of their authors. These will be found in the separate articles devoted to the principal Greek writers. The object of the following pages will be to sketch the literary development as a whole, to show how its successive periods were related to each other, and to mark the dominant characteristics of each.

A process of natural growth may be traced through all the best work of the Greek genius. The Greeks were not literary imitators of foreign models; the forms of poetry and prose in which they attained to such unequalled excellence were first developed by themselves. Their literature had its roots in their political and social life; it is the spontaneous expression of that life in youth, maturity, and decay; and the order in which its several fruits are produced is not the result of accident or caprice. The series of its seasons is as much the result of natural laws as the sequence of spring, summer, and autumn. Further, the old Greek literature has a striking completeness, due to the fact that each great branch of the Hellenic race bore a characteristic part in its development. Ionians, Æolians, Dorians, in turn contributed their share. Each dialect corresponded to a certain aspect of Hellenic life and character. Each found its appropriate work.

The Ionians on the coast of Asia Minor—a lively and genial people, delighting in adventure, and keenly sensitive to everything bright and joyous—created artistic epic poetry out of the lays in which Æolic minstrels sang of the old Achæan wars. And among the Ionians arose elegiac poetry, the first variation on the epic type. These found a fitting instrument in the harmonious Ionic dialect, the flexible utterance of a quick and versatile intelligence. The Æolians of Lesbos next created the lyric of personal passion, in which the traits of their race—its chivalrous pride, its bold but sensuous fancy—found a fitting voice in the fiery strength and tenderness of Æolic speech. The Dorians of the Peloponnesus, Sicily, and Magna Græcia then perfected the choral lyric for festivals and religious worship; and here again an earnest faith, a strong pride in Dorian usage and renown, had an apt interpreter in the massive and sonorous Doric. Finally, the Attic branch of the Ionian stock produced the drama, blending elements of all the other kinds, and developed an artistic literary prose in history, oratory, and philosophy. It is in the Attic literature that the Greek mind receives its most complete interpretation.

Extant Greek literature begins with the Homeric poems. These are works of art which imply a long period of antecedent poetical cultivation. Of the pre-Homeric poetry we have no remains, and very little knowledge. Such glimpses as we get of it connect it with two different stages in the religion of the prehistoric Hellenes.

War-ballads were the materials from which the earliest epic poetry of Greece was constructed. By an "epic" poem the Greeks meant a narrative of heroic action in hexameter verse. The term *epe* meant at first simply "verses;" it acquired its special meaning only when *mele*, lyric songs set to music, came to be distinguished from *epe*, verses not set to music, but merely recited. Epic poetry is the only kind of extant Greek poetry which is older than about 700 B.C. The early epics of Greece is represented by the *Iliad* and the *Odyssey*, Hesiod, and the Homeric hymns; also by some fragments of the "Cyclic" poets.

After the Dorian conquest of the Peloponnesus, the Æolian emigrants who settled in the northwest of Asia Minor brought with them the warlike legends of their chiefs, the Achæan princes of old. These legends lived in the ballads of the Æolic minstrels, and from them

passed southward into Ionia, where the Ionian poets gradually shaped them into higher artistic forms. Among the seven places which claimed to be the birthplace of Homer, that which has the best title is Smyrna. Homer himself is called "son of Meles"—the stream which flowed though old Smyrna, on the border between Æolia and Ionia. The tradition is significant in regard to the origin and character of the *Iliad*, for in the *Iliad* we have Achæan ballads worked up by Ionian art. A preponderance of evidence is in favor of the view that the *Odyssey* also, at least in its earliest form, was composed on the Ionian coast of Asia Minor. According to the Spartan account, Lycurgus was the first to bring to Greece a complete copy of the Homeric poems, which he had obtained from the Creophyllidæ, a clan or guild of poets in Samos. A better authenticated tradition connects Athens with early attempts to preserve the chief poetical treasure of the nation. Solon, it has been thought, enacted that the poems should be recited from an authorized text; Hipparchus, that they should be recited in a regular order. At any rate, we know that in the sixth century B.C. a recitation of the poems of Homer was one of the established competitions at the Panathenæa, held once in four years. The reciter was called a *rhapsodist*—properly one who weaves a long, smoothly-flowing chant, then an epic poet who chants his own or another's poem. The rhapsodist did not, like the early minstrel, use the accompaniment of the harp; he gave the verses in a flowing recitative, bearing in his hand a branch of laurel, the symbol of Apollo's inspiration. In the fifth century B.C. we find that various Greek cities had their own editions of the poems, for recitation at their festivals. Among these were the editions of Massilia, of Chios, and of Argos. There were also editions bearing the name of the individual editor—the best known being that which Aristotle prepared for Alexander. The recension of the poems by Aristarchus (156 B.C.) became the standard one, and is probably that on which the existing text is based. The oldest Homeric MS. extant, Venetus A of the *Iliad*, is of the tenth century; the first printed edition of Homer was that edited by the Byzantine Demetrius Chalcondyles (Florence, 1488). The first Aldine edition appeared twelve years later.

The ancient Greeks were almost unanimous in believing the *Iliad* and the *Odyssey* to be the work of one man, Homer, to whom they also ascribed some extant hymns, and probably much more besides. Aristotle and Aristarchus seem to have put Homer's date about 1044 B.C., Herodotus about 850 B.C. It was not till about 170 B.C. that the grammarians Hellanicus and Xenon put forward the view that Homer was the author of the *Iliad*, but not of the *Odyssey*. Those who followed them in assigning different authors to the two poems were called the Separators (or *Chorizonte*). It is now generally admitted that the *Iliad* and the *Odyssey*, whatever their absolute or relative ages, must at least be regarded as belonging to the maturity of a poetical school in Ionia, which had gradually created an epic style. Next, it can no longer be doubted that the *Iliad* contains elements of various age and origin; the form and the matter alike show this, though we cannot with certainty point to any one group of these elements as the original nucleus around which our *Iliad* grew. Comparing the *Odyssey* with the *Iliad*, we perceive greater unity of design and of coloring, and indications of a somewhat later time; but not even here can we affirm that the poem, as we have it, is the work of one man.

The Ionian school of epos produced a number of poems founded on the legends of the Trojan war, and intended as introductions or continuations to the *Iliad*

and the *Odyssey*. The name of "epic cycle" was properly applied to a prose compilation of abstracts from these epics, pieced together in the order of the events. The compilers were called "cyclic" writers, and the term has now been transferred to the epic poets whom they used.

The epic poetry of Ionia celebrated the great deeds of heroes in the old wars. But in Greece proper there arose another school of epos, which busied itself with religious lore and ethical precepts, especially in relation to the rural life of Boeotia. This school is represented by the name of Hesiod. The legend spoke of him as vanquishing Homer in a poetical contest at Chalcis, in Eubœa; and it expresses the fact that, to the old Greek mind, these two names stood for two contrasted epic types. Nothing is certainly known of his date, except that it must have been subsequent to the maturity of Ionian epos. He is conjecturally placed about 850-800 B.C., but some would refer him to the earlier part of the seventh century B.C. In Hesiod's *Works and Days* we have the earliest example of a didactic poem. The seasons and the labors of the Boeotian farmer's year are followed by a list of the days which are lucky or unlucky for work. The *Theogony*, or "Origin of the Gods," describes first how the visible order of nature arose out of chaos; next, how the gods were born.

The elegiac meter is, in form, a simple variation on the epic meter, obtained by docking the second of two hexameters so as to make it a verse of five feet or measures. But the poetical capabilities of the elegiac couplet are of a wholly different kind from those of heroic verse. *Elegos* seems to be the Greek form of a name given by the Carians and Lydians to a lament for the dead. This was accompanied by the soft music of the Lydian flute, which continued to be associated with Greek elegy. The non-Hellenic origin of elegy is indicated by this very fact. The flute was to the Greeks an Asiatic instrument,—string instruments were those which they made their own,—and it would hardly have been wedded by them to a species of poetry which had arisen among themselves. The early elegiac poetry of Greece was by no means confined to mourning for the dead. War, love, politics, proverbial philosophy, were in turn its themes; it dealt, in fact, with the chief interest of the poet and his friends, whatever that might be at the time. It is the direct expression of the poet's own thoughts, addressed to a sympathizing society. This is its first characteristic. The second is that, even when most pathetic or most spirited, it still preserves, on the whole, the tone of conversation or of narrative.

Elegy, as we have seen, was the first slight deviation from epos. But almost at the same time another species arose which had nothing in common with epos, either in form or in spirit. This was the iambic. The word *iambos* (*iapto*, to dart or shoot) was used in reference to the licensed raillery at the festivals of Demeter; it was the maiden Iambe, the myth said, who drew the first smile from the mourning goddess. The iambic meter was at first used for satire; and it was in this strain that it was chiefly employed by its earliest master of note, Archilochus of Paros, (670 B.C.) But it was adapted to the expression generally of any pointed thought. Thus it was suitable to fables.

The lyric poetry of early Greece may be regarded as the final form of that effort at self-expression which in the elegiac and iambic is still incomplete. The lyric expression is deeper and more impassioned. Its intimate union with music and with the rhythmical movement of the dance gives to it more of an ideal character. At the same time the continuity of the music permits pauses to the voice, pauses necessary as reliefs after a climax. Before lyric poetry could be effective, it was necessary

that some progress should have been made in the art of music. The instrument used by the Greeks to accompany the voice was the four-stringed lyre, and the first great epoch in Greek music was when Terpander of Lesbos (660 B.C.), by adding three strings, gave the lyre the compass of the octave. Further improvements are ascribed to Olympus and Thaletas. By 500 B.C. Greek music had probably acquired all the powers of expression which the lyric poet could demand. The period of Greek lyric poetry may be roughly defined as from 670 to 440 B.C. Two different parts in its development were taken by the Æolians and the Dorians.

The culmination of the lyric poetry is marked by two great names, Simonides and Pindar. Simonides was an Ionian of the island of Ceos, but his lyrics belonged by form to the choral Dorian school. Many of his subjects were taken from the events of the Persian wars: his epitaphs on those who fell at Thermopylæ and Salamis were celebrated. In him the lyric art of the Dorians is interpreted by Ionian genius, and Athens—where part of his life was passed—is the point at which they meet. Simonides is the first Greek lyricist whose significance is not merely Æolian or Dorian, but Panhellenic. The same character belongs even more completely to his younger contemporary, Pindar was born in Bœotia of a Dorian stock; thus, as Ionian and Dorian elements meet in Simonides, so Dorian and Æolian elements meet in Pindar. Simonides was perhaps the most tender and most exquisite of the lyric poets. Pindar was the boldest, the most fervid and the most sublime. His extant fragments represent almost every branch of the lyric art. But he is known to us mainly by forty-four *Epinicia*, or odes of victory, for the Olympian, Pythian, Nemean and Isthmian festivals. The general characteristic of the treatment is that the particular victory is made the occasion of introducing heroic legends connected with the family or city of the victor, and of inculcating the moral lessons which they teach. No Greek lyric poetry can be completely appreciated apart from the music, now lost, to which it was set. Pindar's odes were, further, essentially occasional poems; they abound in allusions of which the effect is partly or wholly lost on us; and the glories which they celebrate belong to a life which we can but imperfectly realize. Of all the Greek poets Pindar is perhaps the one to whom it is hardest for us to do justice; yet we can at least recognize his splendor of imagination, his strong rapidity, and his soaring flight.

The Ionians of Asia Minor, the Æolians, and the Dorians had now performed their special parts in the development of Greek literature. Epic poetry had interpreted the heroic legends of warlike deeds done by Zeus-nourished kings and chiefs. A new form of poetry was now to be created, with elements borrowed from all the rest. And this was to be achieved by the people of Attica, in whose character and language the distinctive traits of an Ionian descent were tempered with some of the best qualities of the Dorian stock.

The drama arose from the festivals of Dionysus, the god of wine, which were held at intervals from the beginning of winter to the beginning of spring. A troop of rustic worshippers would gather around the altar of the god, and sing a hymn in his honor, telling of his victories or sufferings in his progress over the earth. "Tragedy" meant "the goat-song," a goat being sacrificed to Dionysus before the hymn was sung. "Comedy," "the village song," is the same hymn regarded as an occasion for rustic jest. Then the leader of the chorus would assume the part of a messenger from Dionysus, or even that of the god himself, and recite an adventure to the worshippers, who made choral response. The next step was to arrange a dialogue be-

tween the leader (*coryphæus*) and one chosen member of the chorus, hence called "the answerer" (*hypocrites*, afterward the ordinary word for "actor"). This last improvement is ascribed to the Attic Thespis, (about 536 B.C.) The elements of drama were now ready.

Æschylus (born 525 B.C.) became the real founder of tragedy by introducing a second actor, and thus rendering the dialogue independent of the chorus. At the same time the choral song—hitherto the principal part of the performance—became subordinate to the dialogue; and drama was mature. Æschylus is also said to have made various improvements of detail in costume and the like; and it was early in his career that the theater of Dionysus under the Acropolis was commenced—the first permanent home of Greek drama, in place of the temporary wooden platforms which had hitherto been used. The system of the "trilogy" and the "tetralogy" is further ascribed to Æschylus,—the "trilogy" being properly a series of three tragedies connected in subject, such as the *Agamemnon*, *Choëphori*, *Eumenides*, which together form the *Oresteia*, or Story of Orestes. Sophocles, who was born thirty years after Æschylus (495 B.C.), is the most perfect artist of the ancient drama. No one before or after him gave to Greek tragedy so high a degree of ideal beauty, or appreciated so finely the possibilities and the limitations of its sphere. He excels especially in drawing character; his *Antigone*, his *Ajax*, his *Edipus*—indeed, all the chief persons of his dramas—are typical studies in the great primary emotions of human nature. He gave a freer scope to tragic dialogue by adding a third actor; and in one of his later plays, the *Edipus at Colonus*, a fourth actor is required. From the time when he won the tragic prize against Æschylus in 468 to his death in 405 B.C. he was the favorite dramatist of Athens; and for us he is not only a great dramatist, but also the most spiritual representative of the age of Pericles. The distinctive interest of Euripides is of another kind. He was only fifteen years younger than Sophocles; but when he entered on his poetical career, the old inspirations of tragedy were already failing. Euripides marks a period of transition in the tragic art, and is, in fact, the mediator between the classical and the romantic drama.

In Attica, as in England, a period of rather less than fifty years sufficed for the complete development of the tragic art. The two distinctive characteristics of Athenian drama are its originality and its abundance. The Greeks of Attica were not the only inventors of drama, but they were the first people who made drama a complete work of art. And the great tragic poets of Attica were remarkably prolific. Æschylus was the reputed author of seventy tragedies, Sophocles of one hundred and thirteen, Euripides of ninety-two; and there were others whose productiveness was equally great.

Comedy represented the lighter side, as tragedy the graver side, of the Dionysiac worship; it was the joy of spring following the gloom of winter. The process of growth was nearly the same as in tragedy; but the Dorians, not the Ionians of Attica, were the first who added dialogue to the comic chorus. Susarion, a Dorian of Megara, exhibited about 580 B.C. pieces of the kind known as *Megarian farces*. The more artistic form of comedy seems, however, to have been developed in Attica. The greatest names before Aristophanes are those of Cratinus and Eupolis; but from about 470 B.C. there seems to have been a continuous succession of comic dramatists. Aristophanes came forward as a comic poet in 427 B.C., and retained his popularity for about forty years. He presents a perhaps unique union of bold fancy, exquisite humor,

critical acumen, and lyrical power. His eleven extant comedies may be divided into three groups according as the license of political satire becomes more and more restricted. In the *Acharnians*, *Knights*, *Clouds*, *Wasps*, and *Peace* (425-421) the poet uses unrestrained freedom. In the *Birds*, *Lysistrata*, *Thesmophoriazusa*, and *Frogs* (414-405) a greater reserve may be perceived. Lastly, in the *Ecclesiazusa* and the *Plutus* (392-388) personal satire is almost wholly avoided.

The development of Greek poetry had been completed before a prose literature had begun to exist. The earliest name in extant Greek prose literature is that of Herodotus; and, when he wrote, the Attic drama had already passed its prime. There had been, indeed, writers of prose before Herodotus; but there had not been, in the proper sense of the term, a prose literature. The causes of this comparatively late origin of Greek literary prose are independent of the question as to the time at which the art of writing began to be generally used for literary purposes. Epic poetry exercised for a long period a sovereign spell over the Greek mind. In it was deposited all that the race possessed of history, theology, philosophy, oratory.

The sense and the degree in which Herodotus was original may be inferred from what is known of earlier prose-writers. For about a century before Herodotus there had been a series of writers in philosophy, mythology, geography, and history. The earliest, or among the earliest, of the philosophical writers were Pherecydes of Syros (550 B.C.) and the Ionian Anaximenes and Anaximand.

Herodotus was born in 484 B.C.; and his history was probably not completed before the beginning of the Peloponnesian War, (431 B.C.) His subject is the struggle between Greece and Asia, which he deduces from the legendary rape of the Argive Io by Phœnicians, and traces down to the final victory of the Greeks over the invading host of Xerxes. His literary kinship with the historical or geographical writers who had preceded him is seen mainly in two things. First, though he draws a line between the mythological and the historical age, he still holds that myths, as such, are worthy to be reported, and that in certain cases it is part of his duty to report them. Secondly, he follows the example of such writers as Hecateus in describing the natural and social features of countries. He seeks to combine the part of the geographer or intelligent traveler with his proper part as historian. But when we turn from these minor traits to the larger aspects of his work, Herodotus stands forth as an artist whose conception and whose method were his own. His history has an epic unity.

Thucydides was only thirteen years younger than Herodotus; but the intellectual space between the men is so great that they seem to belong to different ages. Herodotus is the first artist in historical writing; Thucydides is the first thinker. The subject of Thucydides is the Peloponnesian War. In resolving to write its history, he was moved, he says, by these considerations. It was probably the greatest movement which had ever affected Hellas collectively. It was not possible for him as a contemporary to record it with approximate accuracy. And this record was likely to have a general value, over and above its particular interest as a record, seeing that the political future was likely to resemble the political past. This is what Thucydides means when he calls his work "a possession forever." The speeches which he ascribes to the persons of the history are, as regards form, his own essays in rhetoric of the school to which Antiphon belongs. As regards matter, they are always so far dramatic that the thoughts and sentiments are such as he conceived possible for the supposed

speaker. Thucydides abstains, as a rule, from moral comment; but he tells his story as no one could have told it who did not profoundly feel its tragic force; and his general claim to the merit of impartiality is not invalidated by the possible exceptions—difficult to estimate—in the cases of Cleon and Hyperbolus.

Strong as is the contrast between Herodotus and Thucydides, their words have yet a character which distinguishes both alike from the historical work of Xenophon in the *Anabasis* and the *Hellenica*. Herodotus gives us a vivid drama with the unity of an epic. Thucydides takes a great chapter of contemporary history, and traces the causes which are at work throughout it, so as to give the whole a scientific unity. Xenophon has not the grasp either of the dramatist or of the philosopher. His work does not possess the higher unity either of art or of science. The true distinction of Xenophon consists in his thorough combination of the practical with the literary character. He was an accomplished soldier who had done and seen much. He was also a good writer, who could make a story both clear and lively. The seven books of the *Hellenica* form a supplement to the history of Thucydides, beginning in 411 and going down to 362 B.C. The chief blot on the *Hellenica* is the author's partiality to Sparta, and in particular to Agesilaus. Some of the greatest achievements of Epaminondas and Pelopidas are passed over in silence. On the whole, Xenophon is perhaps seen at his best in his narrative of the *Retreat of the Ten Thousand*—a subject which exactly suits him.

The steps by which an Attic prose style was developed, and the principal forms which it assumed, can be traced most clearly in the Attic orators. Every Athenian citizen who aspired to take part in the affairs of the city, or even to be qualified for self-defense before the law-court, required to have some degree of skill in public speaking; and an Athenian audience looked upon public debate, whether political or forensic, as a competitive trial of proficiency in a fine art. Hence the speaker, no less than the writer, was necessarily a student of finished expression; and oratory had a more direct influence on the general structure of literary prose than has ever perhaps been the case elsewhere. A systematic rhetoric took its rise in Sicily, where Corax of Syracuse (466 B.C.) devised his *Art of Words* to assist those who were pleading before the law-courts; and it was brought to Athens by his disciple Tisias.

Antiphon represents the earliest, and what has been called the grand, style of Attic prose; its chief characteristics are a grave, dignified movement, a frequent emphasis on verbal contrasts, and a certain austere elevation. Lysias, the representative of the "plain style," breaks through the rigid mannerism of the elder school, and uses the language of daily life with an ease and grace which, though the result of study, do not betray their art. Isocrates, whose manner may be regarded as intermediate between that of Antiphon and that of Lysias, wrote for readers rather than for hearers. The type of literary prose which he founded is distinguished by ample periods, by studied smoothness, and by the temperate use of rhetorical ornament. From the middle of the fourteenth century B.C. the Isocratic style of prose became general in Greek literature. Demosthenes excels all other masters of Greek prose not only in power but in variety; his political speeches, his oration in public or private causes, show his consummate and versatile command over all the resources of the language. In him the development of Attic prose is completed, and the best elements in each of its earlier phases are united. The modern world can more easily appreciate Demosthenes as a great natural orator than as an elaborate artist.

But, in order to apprehend his place in the history of Attic prose, we must remember that the ancients felt him to be both; and that he was even reproached by detractors with excessive study of effect. *Æschines* is the most theatrical of the Greek orators; he is vehement, and often brilliant, but seldom persuasive. *Hyperides* was, after *Demosthenes*, probably the most effective; he had much of the grace of *Lysias*, but also a wit, a fire, and a pathos which were his own. The one oration of *Lycurgus* which remains to us is earnest and stately, reminding us both of *Antiphon* and of *Isocrates*. *Dinarchus* was merely a bad imitator of *Demosthenes*. There seems more reason to regret that *Demades* is not represented by larger fragments. The decline of Attic oratory may be dated from *Demetrius of Phalerum* (318 B.C.), the pupil of *Aristotle*. *Cicero* names him as the first who impaired the vigor of the earlier eloquence, "preferring his own sweetness to the weight and dignity of his predecessors."

The place of *Plato* in the history of Greek literature is as unique as his place in the history of Greek thought. The literary genius shown in the dialogues is many-sided; it includes dramatic power, remarkable skill in parody, a subtle faculty of satire, and, generally, a command over the finer tones of language. In passages of continuous exposition, where the argument rises into the higher regions of discussion, *Plato's* prose takes a more decidedly poetical coloring—never florid or sentimental, however, but lofty and austere. In *Plato's* later works—such, for instance, as the *Laws*, *Timæus*, *Critias*—we can perceive that his style did not remain unaffected by the smooth literary prose which contemporary writers had developed. *Aristotle's* influence on the form of Attic prose literature would probably have been considerable if his *Rhetoric* had been published while Attic oratory had still a vigorous life before it. But in this, as in other departments of mental effort, it was *Aristotle's* lot to set in order what the Greek intellect had done in that creative period which had now come to an end. His own chief contribution to the original achievements of the race was the most fitting one that could have been made by him in whose lifetime they were closed. He bequeathed an instrument by which analysis could be carried further, he founded a science of reasoning, and left those who followed him to apply it in all those provinces of knowledge which he had mapped out. *Theophrastus*, his pupil and his successor in the Lyceum, opens the new age of research and scientific classification with his extant works on botany, but is better known to modern readers by his lively *Characters*, the prototypes of such sketches in our own literature as those of *Hall*, *Overbury*, and *Earle*.

The period of decadence in Greek literature begins with the extinction of free political life in the Greek cities. So long as the Greek commonwealths were independent and vigorous, Greek life rested on the identity of the man with the citizen. The market-place, the assembly, the theater, were places of frequent meeting, where the sense of citizenship was quickened, where common standards of opinion or feeling were formed. Poetry, music, sculpture, literature, art, in all their forms, were matters of public interest. Every citizen had some degree of acquaintance with them, and was in some measure capable of judging them. The poet and the musician, the historian and the sculptor, did not live a life of studious seclusion or engrossing professional work. They were, as a rule, in full sympathy with the practical interests of their time. Their art, whatever its form might be, was the concentrated and ennobled expression of their political existence. Criticism was in the hands of a literary clique or of a social caste. The influence of jealousy or malevolence, and

the more fatal influence of affectation, had little power to affect the verdict. The verdict was pronounced by the whole body of the citizens. The success or failure of a tragedy was decided, not by the minor circumstance that it gained the first or second prize, but by the collective opinion of the citizens assembled in the theater of *Dionysus*.

Philip of Macedon did not take away the municipal independence of the Greek cities, but he dealt a death-blow to the old political life. The Athenian poet, historian, artist, might still do good work, but he could never again have that which used to be the very mainspring of all such activity—the daily experience and consciousness of participation in the affairs of an independent state. He could no longer breathe the invigorating air of constitutional freedom, or of the social intercourse to which that freedom lent dignity as well as grace. Then came *Alexander's* conquests; Greek civilization was diffused over Asia and the East by means of Greek colonies in which Asiatic and Greek elements were mingled. The life of such settlements, under the monarchies into which *Alexander's* empire broke up, could not be animated by the spirit of the Greek commonwealths in the old days of political freedom. But the externals of Greek life were there—the temples, the statues, the theaters, the porticoes. Ceremonies and festivals were conducted in the Greek manner. In private life Greek usages prevailed. Greek was the language most used; Greek books were in demand. The mixture of races would always in some measure distinguish even the outward life of such a community from that of a pure Greek state; and the facility with which Greek civilization was adopted would vary in different places. Syria, for example, was rapidly and completely Hellenized. Judæa resisted the process to the last. In Egypt a Greek aristocracy of office, birth, and intellect existed side by side with a distinct native life. But, viewed in its broadest aspect, this new civilization may be called Hellenism.

Alexandria was the center of Greek intellectual activity from *Alexander* to *Augustus*. Its "Museum" or college, and its library, both founded by the first *Ptolemy* (*Soter*), gave it such attractions for learned men as no other city could rival. The labors of research or arrangement are those which characterize the Alexandrian period. But it is not for its poetry of any kind that this period of Greek literature is memorable. Its true work was in erudition and science. *Aristarchus* (156 B.C.), the greatest in a long line of Alexandrian critics, set the example of a more thorough method in revising and interpreting the ancient texts, and may in this sense be said to have become the founder of scientific scholarship. The critical studies of Alexandria, carried on by the followers of *Aristarchus*, gradually formed the basis for a science of grammar. Translation was another province of work which employed the learned of Alexandria—where the Septuagint version of the Old Testament was begun, probably about 300–250 B.C. Chronology was treated scientifically by *Eratosphenes*, and was combined with history by *Manetho* in his chronicles of Egypt, and by *Berosus* in his chronicles of Chaldaea. *Euclid* was at Alexandria in the reign of *Ptolemy Soter*. Alexandria produced a few eminent men of science, some learned poets (in a few cases, of great literary merit), and many able scholars. The preservation of the best Greek literature was due chiefly to the unremitting care of the Alexandrian critics, whose appreciation of it partly compensated for the decay of the old Greek perceptions in literature and art, and who did their utmost to hand it down in a form as free as possible from the errors of copyists. On the whole, the patronage of letters by the *Ptolemies* had probably as

large a measure of success as was possible under the existing conditions; and it was afforded at a time when there was special danger that a true literary tradition might die out of the world.

The Græco-Roman period in the literature of Hellenism may be dated from the Roman subjugation of Greece. "Greece made a captive of the rough conqueror," but it did not follow from this intellectual conquest that Athens became once more the intellectual center of the world. Under the empire, indeed, the university of Athens long enjoyed a preëminent reputation. But Rome gradually became the point to which the greatest workers in every kind were drawn.

The first part of the Græco-Roman period may be defined as extending from 146 B.C. to the close of the Roman republic. At its commencement stands the name of one who had more real affinity than any of his contemporaries with the great writers of old Athens, and who, at the same time, saw most clearly how the empire of the world was passing to Rome. The subject of Polybius was the history of Roman conquest from 264 to 146 B.C. His style, plain and straightforward, is free from the florid rhetoric of the time. But the distinction of Polybius is that he is the last Greek writer who in some measure retains the spirit of the old citizen-life. The chief historical work which the following century produced—the *Universal History* of Diodorus Siculus—resembled that of Polybius in recognizing Rome as the political center of the earth, as the point on which all earlier series of events converged. In all else Diodorus represents the new age in which the Greek historian had no longer the practical knowledge and insight of a traveler, a soldier or a statesman, but only the diligence, and usually the dullness, of a laborious compiler.

The Greek literature of the Roman empire, from Augustus to Justinian, was enormously prolific. The area over which the Greek language was diffused—either as a medium of intercourse or as an established branch of the higher education—was coëxtensive with the empire itself. An immense store of materials had now been accumulated, on which critics, commentators, compilers, imitators, were employed with incessant industry. In very many of its forms, the work of composition or adaptation had been reduced to a mechanical knack. If there is any one characteristic which broadly distinguishes the Greek literature of these five centuries, it is the absence of originality either in form or in matter. Lucian is, in his way, a rare exception; and his great popularity—he is the only Greek writer of this period, except Plutarch, who has been widely popular—illustrates the flatness of the arid level above which he stands out.

In the manifold prose work of this period, four principal departments may be distinguished. (1) *History*, with *Biography*, and *Geography*. It would exceed the limits of the present summary to notice in detail the works which belong to this and to the other provinces; but it may be useful, for purposes of reference and classification, to give some chief names in each. History is represented by Dionysius of Halicarnassus,—also memorable for his criticisms on the orators and his effort to revive a true standard of Attic prose,—by Josephus, Arrian, Appian, and Herodianus. In biography, the foremost names are Plutarch, Diogenes Laërtius, and Philostratus; in geography, Strabo and Pausanias. (2) *Erudition and Science*. The learned labors of the Alexandrian schools were continued in all their various fields. Under this head may be mentioned such works as the lexicon of Julius Pollux; the commentaries of Galen on Plato and on Hippocrates; the learned miscellanies of Athenæus, Ælian, and Stobæus; and the

Stratagems of Polyænus. (3) *Rhetoric and Belles Lettres*. The most popular writers on the theory of rhetoric were Hermogenes, Aphthonius, and Cassius Longinus—the last the reputed author of the essay *On Sublimity*. Among the most renowned teachers of rhetoric—now distinctively called "Sophists," or rhetoricians—were Dion Chrysostom, Ælius Aristides, Themistius, Himerius, Libanius, and Herodes Atticus. Akin to the rhetorical exercises were various forms of ornamental or imaginative prose—dialogues, letters, essays, or novels. Lucian, in his dialogues, exhibits more of the classical style and of the classical spirit than any writer of the later age; he has also a remarkable affinity with the tone of modern satire, as in Swift or Voltaire. His Attic prose, though necessarily artificial, was at least the best that had been written for four centuries. The Emperor Julian was the author both of orations and of satirical pieces. The chief of the Greek novelists are Xenophon of Ephesus and Longus, representing a purely Greek type of romance, and Heliodorus,—with his imitators Achilles Tatius and Chariton,—representing a school influenced by Oriental fiction. There were also many Christian romances in Greek, usually of a religious tendency. Alciphron's fictitious *Letters*—founded largely on the New Comedy of Athens—represent the same kind of industry which produced the letters of Phalaris and many similar collections. (4) *Philosophy* is represented chiefly by Epictetus and Marcus Aurelius, in both of whom the Stoic element is the prevailing one; by the Neoplatonists, such as Plotinus, Porphyry, Iamblichus; and by Proclus, of that eclectic school which arose at Athens in the fifth century A.D.

The Greek poetry of this period presents no work of high merit. Babrius versified the *Æsopic Fables*; Oppian wrote didactic poems on fishing and hunting; Nonnus and Quintus Smyrnæus made elaborate essays in epic verse; and the Orphic lore inspired some poems and hymns of a mystic character. The so-called *Sibylline Oracles*, in hexameter verse, range in date from about 170 B.C. to 700 A.D., and are partly the expression of the Jewish longings for the restoration of Israel, partly predictions of the triumph of Christianity. By far the most pleasing compositions in verse which have come to us from this age are some of the short poems in the Greek Anthology, which includes some pieces as early as the beginning of the fifth century B.C., and some as late as the sixth century of the Christian era.

The fourth century may be said to mark the beginning of the last stage in the decay of literary Hellenism. From that point the decline was rapid and nearly continuous. The attitude of the church toward it was no longer that which had been held by Clement of Alexandria, Eusebius, Justin Martyr, or by Origen. There was a Christian Greek literature, and a Christian Greek eloquence of extraordinary power. The laity became more and more estranged from the Greek literature—however intrinsically pure and noble—of the pagan past. At the same time the Greek language—which had maintained its purity in Italian seats—was becoming corrupted in the new Greek Rome of the East. In 529 A.D. Justinian put forth an edict by which the schools of heathen philosophy were formally closed. The golden time of the Byzantine literature was from about 850 to 1200 A.D. Just as this was drawing to an end, a poetry—at first satirical—arose in the popular dialect, which had now decidedly diverged from the literary; and thus the link was made which connects the Byzantine period with the Greek literature of to-day. The Greek language has never died, and the continuity of Greek literature has never been broken.

The literature of the Byzantine period, from the death

of Justinian to the capture of Constantinople by the Turks, is singularly destitute of interest for the general reader. There is not a single work of intense human passion. Not one man appeared gifted with anything like genius. The most notable books are books of history written by those who were themselves actors in the scenes, or at the least were contemporaries, or nearly contemporaries, of the events recorded. There is always a sense of reality about such works, however hazy our general conception of the times may be. Of these historians a full account is given in the article *BYZANTINE HISTORIANS*.

The character of the Byzantine period is seen in the kind of poetry that it produced. There were some good epigram writers in the reign of Justinian, but after his time the anthology received very few additions. Theodorus Prodromus is perhaps of all the Byzantine writers the one that comes nearest to the rank of a poet, yet even this approach is made only in some of his poems in the popular dialect, which have a strong satiric turn and a vein of humor. His more ambitious efforts have no claim to the title of poetry. The subjects are of wide range and various form—epistles, congratulatory addresses, historical and didactic poems.

Dramatic poetry was also neglected, but enough was produced to keep up the continuity in the tradition of the drama. We have already seen that Prodromus composed dramas. The most voluminous writer in this department is Manuel Philes of Ephesus, who flourished from about 1280 to 1330, and who himself probably acted on the stage. His dramas are occupied with the exhibition of the great deeds of his patrons, or resemble in some respects our Moralities, making characters of the various virtues.

When we pass from poetry to prose we meet with the same want of creative power. The Byzantines collect the writings of others and annotate, but they give us no original works. They performed two services to literature. They handed down the forms of literary expression, and by their indefatigable energy in excerpting and embodying in their own works the works of others, they have preserved for us many valuable documents of antiquity, or at least portions of them.

Several of the Byzantines attained to high eminence in the cultivation of science, but sometimes their exertions took a fruitless direction, especially when they aimed at discovering the method of converting the baser metals into gold. It is in the study of grammar, in the production of lexicons and the annotation of the classical writers, that their best men have gained for themselves a name.

In narrating the history of modern Greek literature several difficulties of a peculiar nature present themselves which do not emerge in an account of the literature of previous periods. The literature is no longer homogeneous, and we have to answer for ourselves the question whether we are to record the literary efforts made by Greeks or the literary efforts made in Greek. We have to divide even those who used Greek into two classes—those who used the ancient language and those who used the modern, though many have used both forms. The ancient language was still the literary language at the time of the capture of Constantinople, and the use of it as a vehicle of literature has been handed down in unbroken tradition to the present day. This has been specially the case with ecclesiastical writers. The church service is in ancient Greek. The New Testament is still read in the original language in Greek churches. The learned priests were familiar with the ancient language, and in learned treatises felt bound, by a firmly impressed tradition, to use only the language which the great fathers of the church had used. Cultivated

Greeks in all lands still continued to make verses in imitation of the ancients. A change took place when Greece revived, in the nineteenth century. All the great writers felt that it was pedantic to adopt many of the old forms of inflection and construction—that, in one word, the ancient language was not fitted to be the vehicle of modern civilization. They therefore resolved to adapt it, to omit what might fetter the full and free expression of modern thought, but to retain at the same time the body and substance of the language. And hence arose a form of the language which is practically identical with the ancient, but transfused with modern ideas, and fitted for the clear and rapid expression of modern literature. The influence of the ancient language on the modern is manifest in every part of it. And it could not be otherwise. Education is spread over every corner of free Greece. But in education the Greek child does not learn the grammar of the modern language but of the ancient. He often reads ancient books, and every cultivated Greek becomes as familiar with Xenophon and Plutarch as an Englishman is with Shakespeare and Milton. Before entering on the history of modern Greek literature, it is necessary to trace the modern language through its various stages. Historians of the Greek language acknowledge that along side of the literary language there existed a conversational, which must have varied in different localities.

After the fall of Constantinople some of the learned Greeks took an interest in the popular form of the language, and one of them, Sophianos, composed a grammar in the first half of the sixteenth century, which Legrand has published, along with a translation by the same scholar of Plutarch's treatise *On the Education of the Young*, into modern Greek. This grammar proves that the popular form of Greek was by that time fully developed, and might still be taken as a good exposition of the ordinary spoken language of illiterate Greeks. Of course there were great varieties in this popular form. Almost every small district and every island had inflections, constructions, and words peculiar to itself.

In narrating the history of this literature, we have, at the earliest stage, to treat separately those who used the classical language and those who used the vulgar. In both cases we cannot draw a fast line at the date of the fall of Constantinople; for, though that event is of great importance in the history of the Greeks as a people, it does not constitute a break in the literary history. It is often imagined that the dispersion of the Greeks in 1453 stood in close connection with the revival of literature in Western Europe. But the fact is, that the Greeks had come into contact with the Westerns long before, and their influence had become decided before the Turks seized the capital of the Greek empire. The crusades had brought Greeks and Latins together. The Latin empire in Constantinople had made the contact still more frequent.

From the earliest times the Greeks were in the habit of putting into verse any remarkable occurrence that stirred their feelings. Crusius tells us that, in his time, Greeks, especially on the islands, contended with each other in repeating or extemporizing verses, and the custom has remained down to the present day. Accordingly the Greek popular poetry is rich in historical subjects. We have already noticed the poems on the battle of Varna and on the taking of Constantinople. There is also a chronicle of the conquest of the Morea (given by Ellissen in his *Analekten*). There are several lamentations over the fall of Constantinople. And the klephtic ballads relate real adventures. Almost every leader in the war of independence had his song in his honor. Some have thought that the largest portion of the ballad poetry of the Greeks is recent; but Legrand's collection, lately

published, shows that some of them belong to very early times, being edited from a manuscript of the sixteenth century. There are two or three famous historical poems connected with the islands. Especially noteworthy is one on the exploits of Mercurius Boua by Coronaios.

There are three poems belonging to the sixteenth and seventeenth centuries which have obtained wide popularity among the Greeks. The first is the *Erotocritos*, the epic poem of modern Greece, of about 11,400 lines. Of its author Vincenzo Cornaro, a Cretan, we know almost nothing; but it is probable that he belonged to a noble Venetian family and lived in the middle or toward the end of the sixteenth century. The tale is one of two lovers who, after many trials of their fidelity to each other, are at last united and blessed. There is genuine poetry in the work. The second poem is a drama called *Erophile*, and its theme is the love of Panaretos and Erophile. The author of it was Georgios Chortakis, who was brought up in Rhethymnos, a Cretan town, and lived toward the end of the sixteenth and beginning of the seventeenth century. It was thought to be nearly the only drama of this period; but Sathas has brought to light the fact that there was a considerable number of them, and he has already published three, *Zeno*, *Sathes*, and *Gyparis*, in addition to the *Erophile*. Some of them are translations, and all of them are closely connected with Italian dramas of the same period. The *Erophile* has interludes to each act, dealing with an entirely different theme, and most probably written by a different author. The third poem, *The Shepherdess*, is a charming idyll written by Nicolaos Demetrios, a native of Apocorone in Crete, who lived in the beginning of the seventeenth century.

There are few prose productions of any importance belonging to the early period of modern Greek literature. Crusius mentions works written by Malaxos, Zigomalas, and Canavoutzis. Sathas has more recently brought to light a number of chroniclers, such as those in the second volume of his *Bibliotheca Græca Medii Ævi*, that relates the history of Cyprus, Leontios Machaira, in the beginning of the fifteenth century, and Georgios Boustronios, whose narrative extends from 1456 to 1501.

In the eighteenth century a revival of enthusiasm for education and literature took place among the Greeks. Schools were established in every important Greek city, school books and translations from Continental languages poured forth from the presses of Venice, Trieste, Vienna, and other places where the Greeks had influence. The leaders in this movement were Eugenios Bulgaris, Nikephoros Theotokis, and Adamantios Corais. The first two, both natives of Corfu, were devout adherents of the Greek Orthodox Church, warm partisans of Russia, and both became archbishops in the Russo-Greek Church. They were true but narrow patriots. They wrote much in defense of Greek orthodoxy as against Latin heresy. Bulgaris also wrote on philosophy and Theotokis on physics, and the latter prepared or translated educational treatises on physics, mathematics, and geography. Far before these stands Adamantios Corais, who was above everything a Greek of widest aim and of the greatest culture.

From the time of Corais we may date a new era in the history of the literature. Henceforth the works become exceedingly numerous, and efforts are made in every direction of literary activity. Perhaps no nation now produces so much literature in proportion to its numbers. The Greeks seem restless in their desire to give expression to their thoughts. They have indeed great difficulties to contend with in the way of publishing. The number of readers is necessarily small, owing to the smallness of the nation. To take an instance,

one of their most important periodicals, the *Athenæum*, containing articles on archaeology and literary history, which should be known to all scholars, had not more than 150 subscribers in 1876, as we are informed in the preface; 600 copies were published, of which 100 were sent by the university of Athens to the various libraries in Europe and America, 150 were distributed free, and only 150 were subscribed and paid for. The number of subscribers had not increased in August, 1879. In these circumstances many rich Greeks have come nobly forward and published books at their own expense. The Greeks have also contributed much to a knowledge of the ancient Greek language. Asopios has gained a great name in this direction, and the contributions of Constantinos Contos are very valuable. They have also done much to collect materials for a knowledge of existing dialects. Investigations have been made into the dialects of the Tzaconians by Economos and Neo-Loecrian by Chalkiopoulos, and lists of peculiar words and forms to be found in Cythera, Chios, Crete, Cyprus, Locris and other places, have appeared in *Pandora* and other journals. Castorichs has written much and well on Latin literature. The Greeks have a very large number of newspapers and journals, if we consider the number of the population; but, as might be expected, their existence is precarious, and many are short lived. Translations abound in modern Greek, especially from the French, but the Greeks have also translated classical English and German works and novels of all kinds.

GREEK CHURCH, THE, or more properly the Eastern Church, is both the source and background of the Western. Christianity arose in the East, and Greek was the language of the Scriptures and early services of the church, but when Latin Christianity established itself in Europe and Africa, and when the old Roman empire fell in two, and the eastern half became separate in government, interests, and ideas from the western, the term Greek or Eastern Church acquired gradually a fixed meaning. It denoted the church which included the patriarchates of Antioch, Alexandria, Jerusalem, and Constantinople, and their dependencies. The ecclesiastical division of the early church, at least within the empire, was based upon the civil. Constantine introduced a new partition of the empire into dioceses, and the church adopted a similar division. The bishop of the chief city in each diocese naturally rose to a pre-eminence, and was commonly called *exarch*—a title borrowed from the civil jurisdiction. In process of time the common title *patriarch* was restricted to the most eminent of these exarchs, and councils decided who were worthy of the dignity. The council of Nicæa recognized three patriarchs—the bishops of Rome, Alexandria, and Antioch. To these were afterward added the bishops of Constantinople and Jerusalem. When the empire was divided there was one patriarch in the West, the bishop of Rome, while in the East there were at first two, then four, and latterly five. This geographical fact has had a great deal to do in determining the character of the Eastern Church. It is not a despotic monarchy governed from one center and by a monarch in whom plenitude of power resides. It is an oligarchy of patriarchs. It is based, of course, on the great body of bishops; but episcopal rule, through the various grades of metropolitan, primate, exarch, attains to sovereignty only in the five patriarchal thrones. Each patriarch is, within his diocese, what the Gallican theory makes the pope in the universal church. He is supreme, and not amenable to any of his brother patriarchs, but is within the jurisdiction of an œcumenical synod. This makes the Greek Church quite distinct in government and traditions of polity

from the Western. It has ever been the policy of Rome to efface national distinctions, but under the shadow of the Eastern Church national churches have grown and flourished. Revolts against Rome have always implied a repudiation of the ruling principles of Ultramontaniam; but the schismatic churches of the East have always reproduced the ecclesiastical polity of the church which they have deserted.

The Greek Church, like the Roman, soon spread out far beyond the imperial dioceses which at first fixed its boundaries, but, unlike the Roman, it did not keep for Christianity all the lands it had once laid hold of. What Rome Christianized, with the exception of Africa, remained Christian. The old empire was overrun by the barbarians, but the conquered empire imposed its law and its religion upon its conquerors, and pagan and heretic became in the end Catholic Christians. In the East it was otherwise. The empire maintained itself long and died hard; but its decline and fall meant not merely the overthrow of the supremacy of the emperors of the East, it meant also the destruction of civilization and the submergence of Christianity. In the West, German and Saxon, and Goth and Lombard, became Christian law-abiding people. In the East Arab and Kurd, the Seljuk and Ottoman Turk, remained what they were before they swarmed over the Eastern empire, and could never be taught either law or gospel. It is true that the Eastern Church more than made up for her losses by her missionary enterprise, but she never conquered her conquerors, and the historian is too apt to speak of her past glories and forget her present strength. The same reason also makes it difficult to describe, with any accuracy, the extent of the Greek Church. She has shifted her position so often that to describe her extent at any one period must be misleading. The church never at any one period occupied all the territories she has possessed.

The patriarchate of Antioch has undergone most changes in extent of jurisdiction, arising from the transfer of sees to Jerusalem, from the progress of the schismatic churches of the East, and from the conquests of the Mahometans. At the height of his power the patriarch of Antioch ruled over twelve metropolitans and 250 suffragan bishops. In the time of the first crusade 153 still survived; now there are scarcely twenty. Most of those that remain are called either metropolitan or archiepiscopal sees, but they have few or no suffragans.

In the earlier period of the church, ecclesiastical followed civil divisions so closely that Jerusalem, in spite of the sacred associations connected with it, was merely an ordinary bishopric dependent on the metropolitan of Caesarea. Ambitious prelates had, from time to time, endeavored to advance the pretensions of their see, but it was not until the council of Chalcedon, in 451, that Jerusalem was made a patriarchate with jurisdiction over Palestine. From this time, on to the inroad of the Saracens, the patriarchate of Jerusalem was highly prosperous. It ruled over three metropolitans with eighty suffragans. The modern patriarch has seven suffragans, all of whom enjoy the titles of metropolitan or archbishop—Caesarea, Scythopolis (Bethshan), Petra, Ptolemais, Sinai, Nablous, Samaria. The patriarchs, however, are non-resident (they live in Constantinople), and the primate of Palestine is the metropolitan of Caesarea.

The patriarch of Alexandria, in ancient times, possessed much more power than the others, and the church ruled by him was much more centralized. He had no metropolitans. His hundred suffragans were ordinary bishops. This perhaps in part accounts for the decay of the Orthodox church in Egypt; at present there is no

bishop but the patriarch. The Christians in Egypt are, for the most part, Monophysites. The church of Nubia has been blotted out. The church of Æthiopia or Abyssinia is Monophysite, and acknowledges the Jacobite patriarch of Cairo.

The great dogmatic work of the Greek church was the definition of that portion of the creed of Christendom which concerns *theology proper*—the doctrines of the essential nature of the Godhead, and the doctrine of the Godhead in relation with mankind in the incarnation, while it fell to the Latin church to define *anthropology*, or the doctrine of man's nature and needs. The controversies which concern us all about the person of Christ, the Theanthropos, for they alone are represented in the schismatic churches of the East.

All the churches of the East, schismatic as well as orthodox, accept unreservedly the decrees of the first two councils. The schismatic churches protest against the additions made to the creeds of Nicæa and Constantinople by succeeding councils. The Nicæa-Constantinopolitan creed declared that Christ was *consubstantial* with the Father, and that He had *become man*. Disputes arose when theologians tried to explain the latter phrase. These differences took two separate and extreme types, the one of which forcibly separated the two natures so as to deny anything like a real union, while the other insisted upon a mixture of the two, or an absorption of the human in the divine. The former was the creed of Chaldaea and the latter the creed of Egypt; Chaldaea was the home of Nestorianism, Egypt the land of Monophysitism. The Nestorians accept the decisions of the first two councils, and reject the decrees of all the rest as unwarranted alterations of the creed of Nicæa. The Monophysites accept the first three councils, but reject the decree of Chalcedon and all that come after it.

The council of Ephesus, the third œcumenical, had insisted upon applying the term Theotokos to the Virgin Mary, and this was repeated in the symbol of Chalcedon, which says that Christ was born of the Virgin Mary, the Theotokos, "according to the manhood." The same symbol also declares that Christ is "to be acknowledged in two natures, * * * indivisibly and inseparably." Hence the Nestorians, who insisted upon the duality of the natures to such a degree as to lose sight of the unity of the person, and who rejected the term Theotokos, repudiated the decrees both of Ephesus and of Chalcedon, and upon the promulgation of the decrees of Chalcedon formally separated from the church. Nestorianism had sprung from an exaggeration of the theology of the school of Antioch, and the schism weakened that patriarchate and its dependencies. It took root in Chaldaea, and became very powerful. No small part of the literature and science of the Mahometan Arabs came from Nestorian teachers, and Nestorian Christianity spread widely. Their principal bishop took the title of patriarch of Babylon. His seat was later removed to Baghdad and then to Mosul; it is now at Julamerik in Kurdistan. In the eleventh century he ruled over twenty-five metropolitans, and his jurisdiction extended from the Tigris to China, from Lake Baikal to South India. Persecutions weakened the church, Timur almost extirpated it. In the sixteenth century a schism occurred; many of the Nestorians yielded obedience to Rome. The Roman Nestorians are usually called Chaldaeans, though all lay claim to the title. At present the patriarch rules over two metropolitan and sixteen suffragan bishops. The Nestorians dwell principally in Kurdistan, though many are found in Mesopotamia and in India. In the latter country they are numerous on the Malabar coast, and are called Thomas Christians.

The term "Jacobite" (from Jacobus Baradaeus, a

Syrian theologian) is properly confined to the Syrian Monophysites, but is sometimes used to denote all the various divisions of this heresy. The Jacobites, therefore, accept the first three councils and reject those that follow. The Armenian Church does the same, and it is common to class the Armenians with the Jacobites, while some theologians have made them more heretical than the Jacobites of Syria and Egypt. This, however, seems a wrong opinion, and the Armenians ought to be reckoned as Orthodox (see ARMENIAN CHURCH). Apart, however, from theological criticism, the Jacobites are arranged under three patriarchates—Antioch, Alexandria, and Armenia. Antioch and Alexandria have intercommunion, but Armenia, in spite of times of reconciliation, stands apart. The Jacobites or Copts of Egypt greatly outnumber the members of the Orthodox Greek Church there. The patriarch assumes jurisdiction over Egypt, Jerusalem, Nubia, Abyssinia, and the Pentapolis. He now resides in Cairo, and is chosen by lot in a council of all the bishops from a number of monks recommended by four convents to whom belongs this privilege. He has for suffragans the bishops of Menouf, Sherkeyeh, Behnese, Fayoum, Miniyeh, Senabau, Manfalout, Siout, Abuteg, Aschumin, Esne, Kauss and Nekada, and Khartoum. He has besides jurisdiction over twenty-six monasteries, and rules nominally over the Church of Abyssinia.

The Syrian Jacobites also form a patriarchate—the patriarchate of Antioch. While Antioch belonged to the empire the persecution of the state drove the Jacobite patriarch from the city. He settled at Amida, now called Caramit, which is still the ecclesiastical center. The second dignity is the maphrian (fruitbearer) of the East, who was originally a missionary bishop to the regions east of the Tigris. He is now settled at Mosul. The Syrian Jacobites could at one time boast twenty metropolitans and one hundred and three bishops; now there are only five metropolitans (Caramit, Mosul, Maadan, Aleppo, and Jerusalem) without suffragans.

The decisions of Chalcedon, which were the occasion of the formation of all these sects outside, did not put an end to Christological controversy inside the Orthodox Greek Church. The most prominent question which emerged in attempting to define further the person of Christ was whether the will belonged to the nature or the person, or, as it came to be stated, whether Christ had two wills or only one. The church in the sixth oecumenical council at Constantinople declared that Christ had two wills. The Monotheletes refused to submit, and the result was the formation of another schismatic church—the Maronite Church of the Lebanon range. The Maronites, however, in the twelfth century were reconciled to Rome, and cannot now be said to belong to the Greek Church.

The relation of the Greek Church to the Roman may be described as one of growing estrangement from the fifth to the eleventh century, and a series of abortive attempts at reconciliation since the latter date. The estrangement and final rupture may be traced to the overweening pretensions of the Roman bishops and to Western innovation in the doctrine of the Holy Spirit, accompanied by an alteration of creed. In the early church three bishops stood forth prominently, principally from the political eminence of the cities in which they ruled—the bishops of Rome, Alexandria, and Antioch. The transfer of the seat of empire from Rome to Constantinople gave the bishops of Rome a possible rival in the patriarch of Constantinople, but the absence of an over-awing court and meddling statesmen did more than recoup the loss to the head of the Roman Church. The theological genius of the East was different from that of the West. The Greek theology had its roots in Greek

philosophy, while a great deal of Western theology was based on Roman law. The Greek fathers succeeded the Sophists; the Latin theologians succeeded the Roman advocates. This gave rise to misunderstandings, and at last led to two widely separate ways of regarding and defining one important doctrine—the procession of the Holy Spirit from the Father or from the Father and the Son. Political jealousies and interests intensified the disputes, and at last, after many premonitory symptoms, the final break came in 1054, when Leo IX. syncretized Michael Cerularius and the whole of the Eastern Church with an excommunication. There had been mutual excommunications before, but they had not resulted in permanent schisms. Now, however, the separation was final, and the ostensible cause of its finality was the introduction by the Latins of two words *filioque* into the creed. It is this addition which was and which still remains the permanent cause of separation. Foulkes has pointed out in his second volume (ch. 1-3) that there was a resumption of intercourse more than once between Rome and Constantinople after 1054, and that the overbearing character of the Norman crusaders, and finally the horrors of the sack of Constantinople in the fourth crusade, were the real causes of the permanent estrangement. It is undeniable, however, that the *filioque* question has always come up to bar the way in any subsequent attempts at intercommunion. The theological question involved is a very small one, but it brings out clearly the opposing characteristics of Eastern and Western theology, and so has acquired an importance far beyond its own worth. The question is really one about the relations subsisting between the persons of the Trinity and their hypostatical properties. The Western Church affirms that the Holy Spirit "proceeds from" the Father and from the Son. It believes that the Spirit of the Father must be the Spirit of the Son also. Such a theory seems alone able to satisfy the practical instincts of the West, which did not concern itself with the metaphysical aspect of the Trinity, but with Godhead in its relation to redeemed humanity. The Eastern Church affirms that the Holy Spirit proceeds from the Father only. The Eastern theologian thinks that the Western double procession degrades the Deity and destroys the perfection of the Trinity. The double procession, in his eyes, means two active principles in the Deity, and it means also that there is a confusion between the hypostatical properties; a property possessed by the Father and distinctive of the First Person is attributed also to the Second. This is the theological, and there is conjoined with it an historical and moral dispute. The Greeks allege that the addition of the words *filioque* was made, not only without authority, and therefore unwarrantably, but also for the purpose of forcing a rupture between East and West in the interests of the barbarian empire of the West.

Attempts at reconciliation were made from time to time afterward, but were always wrecked on the two points of papal supremacy, when it meant the right to impose Western usages upon the East, and of addition to the creed. First there was the negotiation between Pope Gregory IX. and the Greek patriarch Germanus. The Latin conditions were practically recognition of papal jurisdiction, the use of unleavened bread enforced on the Greeks, and the Greeks to be permitted to omit *filioque* on condition that they burnt all books written against the Western doctrine. The Greek patriarch refused the terms. Then came negotiations under Innocent IV. and Clement IV., in which the popes proposed the same conditions as Gregory IX., with additions. These proposals were rejected by the Greeks, who regarded them as attempts to enforce new creeds on their church.

The negotiations at the council of Lyons (1274) were,

strictly speaking, between the pope and the Greek emperor, and were more political than ecclesiastical. Michael Palæologus ruled in Constantinople while Baldwin II., the last of the Latin emperors, was an exile in Europe. Palæologus wished the pope to acknowledge his title to be emperor of the East, and in return promised submission to the papal supremacy and the union of the Greek with the Latin Church on the pope's own terms. This enforced union lasted only during the lifetime of the emperor. The only other attempt at union which requires to be mentioned is that made at the council of Florence. It was really suggested by the political weakness of the Byzantine empire and the dread of the approach of the Turks. John Palæologus the emperor, Joseph the patriarch of Constantinople, and several Greek bishops came to Italy and appeared at the council of Florence—the papal council, the rival of the council of Basel. As on former occasions the Greeks were at first deceived by false representations; they were betrayed into recognition of papal supremacy, and tricked into signing what could afterward be represented as a submission to Western doctrine. The natural consequences followed—a repudiation of what had been done; and the Greek bishops on their way home took care to make emphatic their ritualistic difference from Rome. Soon after came the fall of Constantinople, and with this event an end to the political reasons for the submission of the Greek clergy. Rome's schemes for a union which meant an unconditional submission on the part of the Greeks did not cease, however, but they were no longer attempted on a grand scale. Jesuit missionaries after the Reformation stirred up schisms in some parts of the Eastern Church, and in Austria and Poland many of the Greeks were compelled to submit themselves to the see of Rome. The result of these schemes has been what is called the *Unia*, or the United Greeks. These various unions have commonly arisen from dissensions among the Greeks themselves when a portion of dissentients have made submission to Rome. Rome commonly promised to allow them to enjoy their own liturgies and rights of worship, but usually broke her promises. This was done so systematically that the college of the Propaganda prints what profess to be the old liturgies of the Eastern churches, which are really so interpolated as to bring them surreptitiously into harmony with the Western rites. This is done so universally that it is impossible to trust to any professedly Eastern creed or service-book printed at the office of the Propaganda in Rome.

The number of adherents of the Greek Church at this date may be given approximately as follows:

Orthodox Greek Church in Turkey.....	10,000,000
“ “ Roumania.....	4,529,000
“ “ Servia.....	1,345,000
“ “ Montenegro.....	130,000
“ “ Greece.....	1,310,000
“ “ Austria.....	3,000,000
“ “ Russia (including Poland, Siberia and the Caucasus).....	58,000,000
	<hr/> 78,314,000

To these may be added:

Russian Dissenters.....	1,051,000
Armenians.....	3,000,000
Nestorians (including the Thomas Christians of India).....	360,000
Syrian Jacobites.....	90,000
Copts.....	121,000
Abyssinians.....	1,200,000
	<hr/> 5,822,000

United Greeks (chiefly in Austria and Poland)..... 4,670,000

GREEK EMPIRE. See GREECE, *ante*.

GREEK FIRE is properly the name applied to the inflammable and destructive compounds used in warfare

in the Middle Ages, and particularly by the Byzantine Greeks at the sieges of Constantinople. It was the precursor of gunpowder, and of such modern compositions as dynamite and nitroglycerine, and was frequently accessory to gunpowder for many years after its invention. But combustible mineral substances were employed in war much earlier than the Middle Ages. Greek fire has borne the names wildfire, maritime fire, wet fire, and fire-rain. The secret of the composition of the ancient Greek fire was so well kept that its constituents are not positively known, but they are believed to have been powdered resin, naphtha, sulphur, saltpeter, etc. During the American civil war a compound of saltpeter, sulphur and lampblack was used at the siege of Charleston with great effect. Bunsen's kakodyle—more on the order of the Chinese stinkpot, owing its deadly efficacy to the arsenic it contains—is among the most fatal of the modern variations of the older forms of such agents.

GREELEY, HORACE, editor, born at Amherst, N. H., Feb. 3, 1811; died near New York Nov. 29, 1872. He was the son of a farmer, and removed to Vermont with his parents in 1821. At fifteen years of age he entered a printing office and worked four years at the case. In August, 1831, he reached New York with only a few dollars in his pocket, and obtained work as a journeyman. In January, 1833, he and another printer named Francis V. Story, bought some type on credit and began on their own account as job printers. Their first work was on the *Daily Post*, the first daily penny paper ever published. It lasted three weeks. Then the firm of Greeley & Co. issued the *New Yorker*, a literary weekly, which was kept alive for several years. In 1836, Mr. Greeley, who had adopted the Universalist faith, married Miss Cheney, of North Carolina.

Greeley's next journalistic venture was *The Jeffersonian*, a Whig campaign paper, which closed its career early in 1839. His next publication was *The Log Cabin*, a weekly which supported General Harrison for president in the campaign of 1840, and met with unprecedented success. In April, 1841, the first number of the New York *Tribune* appeared. It was a small sheet and sold for one cent, but to its development into a great and influential newspaper Mr. Greeley devoted his life. His associate editor was Henry J. Raymond, a young New Yorker, and among the contributors to the early issues were Charles A. Dana, George William Curtis, Margaret Fuller, Bayard Taylor, and other prominent persons. The *Tribune* prospered from the start, but was hampered by Greeley's eccentricities and wretched business management. Beginning as a Whig organ, it became the champion of the Anti-Slavery Whigs, and after 1856 supported the Republican party. It advocated the election of Henry Clay in 1844, of General Scott in 1852 of Fremont in 1856, of Lincoln in 1860 and 1864 and of Grant in 1868. Through its columns Mr. Greeley introduced to the American public the social heresies of Fourier and the spirit-rapping frauds of the Fox sisters. He advocated a protectionist policy, the abolition of slavery, and the encouragement of coöperation, and he opposed capital punishment, and favored the cause of education. For many years the *Tribune*, which several times advanced its price, and more often increased its size, was the printed embodiment of Horace Greeley, and in the minds of thousands of readers the man and the paper were inseparably connected. During the civil war the circulation of the daily often exceeded 60,000, while the weekly edition, by which every Republican in the East swore, sometimes numbered a quarter of a million copies.

Mr. Greeley's essays in political life, when he left the

privacy of his office to engage openly on the floor of the legislature, were not very successful. In 1848 he filled a three months' vacancy in Congress, during which time he exposed the abuses of the mileage system by members. In 1861, and again in 1867, he was an unsuccessful candidate for the United States Senate. He was a delegate-at-large to the New York Constitutional Convention of 1867, but paid little attention to its proceedings. In 1869 he was defeated for State Comptroller, and in 1870 for Congress. He considered himself a great politician, and with William H. Seward and Thurlow Weed dictated nominations and ordained modes of action for his political following. But he quarreled with Seward, and did more than any other man to defeat his nomination for President in the Chicago Convention of 1860. His opposition to slavery intensified as time went on. He opposed the Mexican war and sympathized with the free-soil movement. He was threatened and assaulted by Southern sympathizers, and was indicted in Virginia for circulating incendiary documents, to wit, the *Tribune*. As the clouds of war began to close over the republic in the winter of 1860-61, Mr. Greeley seemed to lose heart, and declared against coercion of the dissentient States. But the sound of the guns at Sumter awoke him, and he rushed, as was his wont, to the other extreme. Heedless of the unprepared condition of the federal forces, he urged an instant prosecution of the war, which, in common with others who should have known better, he declared could be ended in ninety days. The columns of his paper bore the stereotyped legend, "On to Richmond," and much of the blame for the early disasters of the war was visited upon Mr. Greeley. But he supported the war with vigor, encouraged volunteering and sustained the draft. He appealed to President Lincoln, in an open letter published in the *Tribune*, to free the slaves wherever the Northern armies could reach; a demand which drew a public reply from Mr. Lincoln, and was followed within a month by the proclamation of emancipation. In 1864 Mr. Greeley went to Canada, with the consent of the government, to consult with some so-called Confederate commissioners in the interest of peace. The negotiations came to nothing, owing to the want of authority of the alleged commissioners. After the war closed, Greeley advocated universal amnesty, and later signed the bail-bond of Jefferson Davis. A storm of indignation in the North greeted this chivalrous action, and the sale of Greeley's *History of the American Conflict*, the second volume of which was then just printed, was completely ruined.

The last chapter in the history of Greeley's political life was a sad one. He supported General Grant in 1868, but differed from the president in regard to his policy in San Domingo, and emphatically disapproved of the "carpet-bag" rule in the reconstructed States. During a trip to the Southwest in 1871, Mr. Greeley became even more impressed with the evils of the new régime, and freely expressed his views. Discontented members of the Republican party joined in the call for the formation of what was known as the Liberal Republican party, and at the convention held in Cincinnati 1872, Mr. Greeley was nominated for president on the sixth ballot. He accepted on the understanding that all political rights should be restored, and the negroes admitted to the rights of suffrage. If elected, he would be the president, not of a party, but of the whole people, and he believed that "the masses were eager to clasp hands across the bloody chasm." The Democratic convention which followed, formally indorsed his nomination, and the Republicans renominated Ulysses S. Grant. The campaign was conducted with great bitterness, and Mr. Greeley himself took the stump and spoke

in New England and the Middle States. But all was of no avail. The Grant ticket had a popular majority of three-quarters of a million, and Mr. Greeley did not carry one Northern State, and only six of the Southern sisterhood. This tremendous defeat, supplemented by the exposure and overwork of the canvass, was intensified by the greatest domestic calamity which Greeley had ever experienced. His wife fell ill, and he watched continuously by her bedside until her death, just before the election. His nervous and physical organization broke down, inflammation of the brain brought on delirium, and on November 29, 1872, Horace Greeley passed from earth. He was buried with great state, the president, vice-president, chief-justice of the Supreme Court, and the State and city officials attending the funeral.

GREENBACK PARTY. After the close of the civil war there followed a period of financial contraction which culminated in 1873 in a financial crisis, in gigantic failures and a commercial panic. During that period the nation was slowly "getting down to hardpan" in the matter of the currency. The exigencies of the war had necessitated the issue of "greenbacks" in vast quantity, and as a natural consequence gold appreciated as compared with paper. The debtor class benefited during the flush times of the war, for money was plenty (of its kind), and they discharged their mortgages and debts incurred in ante-war times with this plentiful money. But as the paper dollar appreciated slowly but steadily to a gold value, wages were reduced and prices fell. The creditor class then got their innings. Money became tight, credits were cut down, and there was a stringency in the money market which in 1873 amounted almost to a national disaster.

The wage-workers and the agriculturists suffered most while this process was going on, and there were not wanting politicians who took advantage of the situation for their personal ends. As early as 1868 the "Ohio idea" was enunciated, that all United States bonds which did not specifically call for payment in coin should be redeemed in greenbacks. The greenback was fondly spoken of as "the money of the people," and the point was raised that capitalists were being paid one hundred cents for bonds which cost them thirty-five to forty cents on the dollar. In political conventions, principally of the Democratic party, the doctrine of redemption in greenbacks was made a plank in the party platform, but an attempt to enforce this doctrine at the national Democratic convention of 1868 was opposed by Mr. Tilden and the Eastern party leaders.

In 1873 the panic culminated. The people were in distress, and saw no way of relief from either of the great political parties. The consequence was that in 1874 a convention was held at Indianapolis, at which a greenback party was organized and a platform adopted. This called for the withdrawal of the national bank note currency, and the creation and practically unlimited issue of a paper currency exchangeable for bonds bearing interest at the rate of 3.65 per cent per annum. It was further provided that all bonds should be redeemed and the interest on them paid in greenbacks, except where repayment in coin had been specifically promised.

Two years later the party had grown big enough to put a presidential ticket in the field. Peter Cooper, of New York, was nominated for president, and Samuel F. Cary, of Ohio, for vice president, and they received about 80,000 of the popular vote.

The labor troubles of 1877 resulted in the formation of a National Labor party, which in 1878 joined forces with the Greenbackers. They held a national convention, and at the fall elections succeeded in electing fourteen congressmen.

In 1880 they nominated James B. Weaver, of Iowa.

for president, and B. J. Chambers, of Texas, for vice-president. These gentlemen received a popular vote of over 300,000, and this time eight Greenback-Labor congressmen were elected.

In 1884 Benjamin F. Butler got the presidential nomination, and a popular vote of 133,728. Its strength has always been greatest in the Western States, and its success in electing congressmen was principally in Iowa. Both the great political parties coquetted with the Greenbackers as occasion served, but the movement may now be considered as dead.

GREEN BAY, capital of Brown county, Wisconsin, is situated at the head of Green Bay, an inlet on the west shore of Lake Michigan. The bay is one hundred miles long, from fifteen to thirty-five miles wide, and of considerable depth. The city stands near the mouth of Fox river, with a small stream known as the East river on the other side, its situation affording it a secure harbor. It is 242 miles north of Chicago, 114 north of Milwaukee, and 120 northeast of Madison, the capital of the State. By the completion of a canal connecting the Fox and Wisconsin rivers at Portage City, Green Bay has become the terminus of the inland water system which unites the great lakes with the Mississippi, and the Gulf of St. Lawrence with the Gulf of Mexico. The nearness of Green Bay to the forests of the State makes it a center of the lumber trade, and it exports annually large quantities of planks, boards, shingles, staves and headings. Population, (1900), 18,684.

GREENBUSH, a village in Rensselaer county, N. Y., on the east bank of the Hudson, opposite Albany. It is the terminus of two railroads, contains freight houses and machine shops, factories, tanneries and banks, and a population (1900) of 2,036.

GREENCASTLE, capital of Putnam county, Ind., thirty-eight miles west by south of Indianapolis; stands at the intersection of the Louisville, New Albany and Chicago, the Indianapolis and St. Louis, and the St. Louis, Vandalia, Terre Haute & Indianapolis railroads. It contains two national banks, four weekly papers, one monthly magazine, seven churches, a high school and graded schools, the Asbury University, also a female college, and manufactures of lumber, pumps, hardware novelties, woolen goods, etc. The city is provided with street railways and electric lights, and is the center of a large trade. Population (1900), 3,661.

GREENSBORO, the capital of Guilford county, North Carolina, is situated on the Richmond and Danville, and the Cape Fear and Yadkin Valley railroads, eighty-one miles northwest of Raleigh. The city is steadily growing in importance as a manufacturing center, and now contains about twenty establishments producing an annual output of about \$5,000,000 in value, consisting principally of iron, steel, lumber, and tobacco. The city also contains four banks, one daily, four weekly, and three monthly publications, two graded schools, a female college, and a seminary for the education of colored teachers, thirteen churches, a court-house, a post-office building completed at a cost of \$70,000, hotels, public halls, and other improvements. The city is lighted by electricity, and is provided with police, fire, water, and sewerage departments. Population, (1900), 10,035.

GREENSBURG, capital of Westmoreland county, Pennsylvania, thirty-one miles from Pittsburg, on the Pennsylvania railroad. It is the center of a rich agricultural district, and the shipping point for the coal mined in the vicinity. The city contains a court-house, four banks, two daily and seven weekly papers,

twelve churches, a high school, graded schools, and a female seminary. The manufactures embrace glass, heating apparatus, iron-pipes and valves, nuts and bolts, carriages, furniture and lumber. Natural gas is used for heating and lighting, and electric railways are successfully operated. Population (1900), 6,508.

GREENVILLE, the capital of Washington county, Mississippi, and one of the most progressive cities between Cairo and New Orleans, is situated on the Mississippi river, 140 miles from Vicksburg, and 260 miles from Memphis. It is also on the Georgia Pacific and Louisville, New Orleans and Texas railroads, and the center and shipping point of the richest cotton growing country in the State. The city is handsomely laid out, and financially, socially and commercially enjoys a widely extended reputation. It contains one daily and five weekly papers, also a monthly magazine, four banks, a court-house, churches, schools, fine hotels and private residences characterized by beauty of design and finish. The manufactures embrace a foundry and machine shop, cotton-seed-oil works, saw mill, cotton compress, etc. Pop. (1900), 7,642.

GREENVILLE, capital of Greenville county, South Carolina, is situated on Reedy river, and on the Richmond and Danville and the Central Georgia railroads, 141 miles from Columbia, the State capital. The surrounding country is devoted to the cultivation of cotton on an extensive scale, of which Greenville is the shipping point. The city is lighted with gas, is provided with street railway facilities, and contains a number of handsome public buildings and private residences. It is also the location of Furman University, the Greenville Military Academy, the Baptist Female College, and other institutions of learning; contains three banks, one daily and four weekly papers, a court-house, ten churches, five hotels, and some lines of manufacture. Population (1900), 11,860.

GREENVILLE, county seat of Darke county, Ohio, is situated on the Cincinnati, Jackson and Mackinaw, Dayton and Union, and Pittsburgh, Cincinnati and St. Louis railroads, ninety-four miles west of Columbus, the State capital. The city is centrally located and in a highly prosperous condition, containing three banks, five weekly papers, twelve churches, a high school, also union schools, a large number of stores, and manufacturing industries embracing foundries and machine shops, tile works, carriage repositories, wringer and broom factories, etc. Population (1900), 5,501.

GREENVILLE, capital of Hunt county, Texas, is on the Missouri, Kansas and Texas railroad, in the midst of a prosperous and highly cultivated portion of the State. Four weekly papers are published here, and there are two national banks. The city contains a court-house, six churches, schools, stores, warehouses, and manufactures of lumber, lumber products, etc. A large business is carried on in the compressing of cotton for shipment to foreign ports. Population (1900), 6,860.

GREENE, MAURICE, an English composer, was born in London toward the close of the seventeenth century. He died September 1, 1755.

GREENE, NATHANAEL, an American general, was born at Potowhommet, Warwick county, Rhode Island, May 27, 1742. From his early years he was employed in assisting his father in the conduct of his business as iron forgemaster, but he succeeded, notwithstanding this, in acquiring a large amount of general information, and made a special study of mathematics, history, and law. At Coventry, where he removed to take charge of a forge of his own, he was the first to

establish a public school; and in 1770 he was chosen a member of the legislature of Rhode Island. Sympathizing strongly with the revolutionists, he in 1774 joined the "Kentish Guards," and on this account was expelled from the Society of Friends. In 1775 he was appointed to the command of the contingent of 1,000 men raised by Rhode Island, and after joining Washington before Boston he was named brigadier-general. In 1776 he obtained the rank of major-general, and accompanied Washington to New Jersey, where he took part in the battles of Trenton and Princeton. At the urgent request of Washington he in 1778 accepted the office of quartermaster-general, on the understanding, however, that he should retain the right to command in the field, a right of which he took advantage at the battle of Monmouth, 24th June of the same year, and at the battle of Springfield, June 23, 1780. In August following he resigned his office, and on the 2d of December he succeeded Gates in the command of the Southern army. At the beginning of the campaign he detached General Morgan to attack the enemy at Cowpens, with a result that was brilliantly successful. Then followed a series of clever retreats to avoid engaging superior forces, until he deemed himself strong enough to attack the enemy at Guilford Court House; and although he here suffered tactical defeat, the British army a few days afterward retreated toward Wilmington. After following a short distance in pursuit he changed his line of march, and advancing into South Carolina attacked Lord Rawdon at Camden, and again suffered a defeat. But this reverse also failed to impede his energy, and after capturing a number of forts he again engaged Lord Rawdon at the battle of Eutaw Springs, which, though a drawn combat, resulted in the British abandoning South Carolina. For his services in the campaign he was presented with two pieces of captured ordnance, a British standard, and a gold medal. Georgia and North and South Carolina also made him valuable grants of land. He died from sunstroke at his estate, Mulberry Grove, Savannah, June 19, 1786.

GREENE, ROBERT, dramatist and miscellaneous writer, was born at Norwich about the year 1560. He died September 2, 1592.

GREENFINCH (German *Grünfink*) or GREEN LINNET, as it is very often called, a common European bird, the *Fringilla chloris* of Linnæus. No species of Greenfinch is found in America.

GREENHEART, one of the most valuable of timbers, is the product of *Nectandra Radia*, natural order *Lauraceæ*, a tree which grows to the height of 70 feet, native of Guiana, where, inland, it exists in great abundance. The Indian name of the tree is Sipiri or Bibiru, and from its bark and fruits is obtained the febrifuge principle Bibirine (see BIBIRINE).

GREENLAND, or GRÖNLAND, is the name applied to a large continental island, the greater portion of which lies within the Arctic Circle, and all of which is arctic in character. It is entirely unconnected with any portion of Europe or America, though in the extreme north only separated from the latter by the narrow strait which lies between it and the outlying portion of America known as Grinnell Land. From Europe it is divided by the North and Greenland Seas—the Faroe Isles, Jan Mayen Island, Iceland and part of Shetland being the only lands between it and Norway. Denmark Strait is the sea between it and Iceland, and it is more than probable that Spitzbergen is the only great group of islands lying to the east of its northern portion. On the west, Davis Strait and Baffin's Bay sepa-

rate it from the opposite shore. The exact northern termination of Greenland is not known, the country never having been doubled on the north.

On the east coast, Cape Bismarck, in 76° 47' N. latitude, marks the limit of exploration; though as early as 1670 Lambert is said to have sighted land several degrees further north. From Cape Bismarck south to Cape Farewell (59° 35' N. latitude) the coast is very imperfectly known, whole stretches being entirely uncharted, even in the rudest fashion. This arises from the Spitzbergen ice-stream continually pouring down that shore, rendering it possible to approach within sight of it only on rare occasions, and to land still more rarely. A number of islands are dotted over the chart here; but there are few "ice fjords," the slope of the inland ice being evidently chiefly toward the west coast. The west coast is of much the same character,—only, on this side, the fjords with which it is intersected have been nearly all followed to their heads. The Greenland fjords, like those of Norway, British Columbia, and other countries with a western exposure, bear every mark of having been at one time the beds of glaciers, when the climate and physical geography of the country were different from what they are at present. The country cannot be said to be mountainous, yet heights of from 3,000 to 4,000 feet are common. There are one or two still higher points, such as Petermann's Peak, near the shores of Franz Josef Fjord on the east coast (11,000 feet), Payer's Peak, Sikkertoppen, and the familiar Sanderson's Hope.

Excluding the extreme northern parts of Greenland, and the northeast coast,—which may be claimed by the English, American and Germans "by right of discovery,"—the trade of Greenland is a strict monopoly of the Danish crown, dating from 1774, and is at present administered in Copenhagen by a government board—the "Kongelige Grönlandske Handel,"—and in the country by various officials in government pay. In order to meet the double purposes of government and trade, the west coast, up to nearly 74° N. latitude, is divided into two inspectorates,—the southern extending to 67° 40' N. latitude, the northern comprising the rest of the country,—their respective seats of government being at Godthaab and Godhavn. These inspectorates are ruled by two superior officials or governors responsible to the director of the board in Copenhagen. Each of the inspectorates is divided into "districts," each district having in addition to the capital or "colony" (a hamlet containing three or four Danish dwellings, a storehouse, blubber-boiling house, in a few cases a Lutheran "missionary" or clergymen, a teacher, and a physician), several outlying posts and Eskimo hunting stations, each presided over by an "udligger," who is responsible to the "colonibestyrrer" or superintendent of the district. These trading settlements, which dot the coast for a distance of 1,000 miles, are about 60 in number, and collect the products from 176 inhabited places. From these Eskimo hunting and fishing stations blubber is the chief article received.

GREENLEAF, SIMON, American jurist, was born at Newburyport, Massachusetts, December 5, 1783. After studying law in Massachusetts and Maine, he began in 1806 to practice at Standish in the latter State, proceeding finally to Portland in 1818. There, after two years, he became reporter of the supreme court of Maine, and during his twelve years of office published nine volumes of *Reports*. Resigning in 1832, Greenleaf became in 1833 Royale professor, and in 1846 Dane professor of law in Harvard University,

where he received the degree of doctor of laws. He retired in 1848 from his active duties, becoming emeritus professor, and after being for some years president of the Massachusetts Bible Society died at Cambridge, Mass., October 6, 1853.

GREENOCK, a seaport town of Renfrewshire, Scotland, on the south bank of the Firth of Clyde, twenty-two miles below Glasgow. The principal industries are shipbuilding and sugar refining. Many of the steamers of the Cunard Company, the Peninsular and Oriental Company, and the Allan Line have been built at Greenock. Population (1901), 67,645.

GREENOUGH, HORATIO, an American sculptor, son of a Boston merchant, was born at Boston, September 6, 1805. At the age of sixteen he entered Harvard College; but while there he devoted his principal attention to art, and in the autumn of 1825 he went to Rome, where he enjoyed the advantage of instruction from Thorwaldsen. After a short visit in 1826 to Boston, where he executed busts of John Quincy Adams and other persons of distinction, he returned to Italy and took up his residence at Florence. Here one of his first commissions was from James Fenimore Cooper for a group of *Chanting Cherubs*; and the success of his work, joined to the strong recommendation of Cooper, Dana, Everett, and others, led to his being chosen by the Government to execute the colossal statue of Washington for the national capital. It was unveiled in 1843; and as an accurate likeness, conceived in a lofty and truly poetical spirit, it is entitled to high rank among modern works of a similar kind. Shortly afterward he received a second commission from Government for a colossal group, the "Rescue," intended to represent the conflict between the Anglo-Saxon and Indian races. In 1851 he returned to Washington to superintend its erection, and in the autumn of 1852 he was attacked by brain fever, of which he died December 18th.

GREENSHANK, one of the largest of the birds commonly known as Sandpipers, the *Totanus glottis* of most ornithological writers. The Greenshank is a native of the northern parts of the Old World, but in winter it wanders far to the south, and occurs regularly at the Cape of Good Hope, in India, and thence throughout the Indo-Malay Archipelago to Australia. In North America it is represented by two species, *Totanus semipalmatus* and *T. melanoleucus*, there called Willets, Telltales, or Tattlers, which, in general habits, resemble the Greenshank of the Old World.

GREENWICH, a market-town and parliamentary borough in the county of Kent, England, is pleasantly situated on the right bank of the Thames, six miles southeast of London Bridge by the river. Fronting the river stands the splendid range of buildings in the Grecian style of architecture, formerly known as Greenwich Hospital, but now the Royal Naval College. It occupies the site of an ancient royal palace called Greenwich house, which was a favorite royal residence as early as 1300, but was granted by Henry V. to Thomas Beaufort, duke of Exeter, from whom it passed to Humphrey, duke of Gloucester; and it did not revert to the crown till his death in 1433. It was the birthplace of Henry VIII., Queen Mary and Queen Elizabeth. The building was enlarged by Edward IV., by Henry VIII., who made it his chief residence and named it *Placentia*, by James I., and by Charles I., who erected the "Queen's House" for Henrietta Maria. Along with other royal palaces it was at the revolution appropriated by the Protector, but it reverted to the crown on the restoration of Charles II., by whom it was pulled down, and the west wing of the present hospital was erected as part of an extensive design which was not further car-

ried out. In its unfinished state it was assigned by the patent of William and Mary to certain of the great officers of state, as commissioners for its conversion into a hospital for seamen. As it now stands, the building consists of four blocks. Behind a terrace eight hundred and sixty feet in length, stretching along the river side, are the buildings erected in the time of Charles II. by Webb from Inigo Jones' design, and in that of Queen Anne from designs by Sir Christopher Wren; and behind these buildings are on the west those of King William, and on the east those of Queen Mary, both from Wren's designs. In the King William range is the painted hall.

Another of the attractions of Greenwich is the park, 190 acres in extent, in which is situated the Royal Observatory. It was inclosed by Humphrey, duke of Gloucester, in 1433, and laid out by Charles II. It still contains a fine avenue of Spanish chestnuts planted in his time; and the hill rising toward the south commands a fine prospect over London, the Thames, and the plains of Essex. The Royal Observatory was built in 1675, for the advancement of navigation and nautical astronomy. From it the exact time is conveyed at one o'clock every day by electric current to London and all other chief towns of the kingdom; and English geographers reckon longitude from its meridian. Population of town (1890) 50,000: of parliamentary borough, 180,000. Pop. now (1902) embraced in Greater London.

GREENWICH, a city of Fairfield county, Connecticut, is beautifully situated on Long Island Sound, and on the New York, New Haven and Hartford railroad, thirty miles from New York city. It contains two banks, one weekly paper, Greenwich Academy, high and graded schools, churches, and manufactures of lumber, stoves, screws, etc. The city has a population (1900) of 2,420.

GREGOIRE HENRI, bishop of Blois and French revolutionist, was born at Vého near Lunéville, December 4, 1750. After studying at Metz and Nancy, he became curé of Embermesnil and professor at the college of Pont-à-Mousson. He was chosen in 1789 by the clergy of the district of Nancy to represent them in the states-general, where he took a leading part in the deliberations, and gave energetic support to the republicans. As a member of the national assembly he proposed the motion for the abolition of the kingly office, which was carried by acclamation. During the trial of Louis XVI., being absent with other three colleagues on a mission for the union of Saxony to France, he along with them wrote a letter urging the condemnation of the king, but omitting the words *à mort*; and he endeavored to save the life of the king by proposing in the assembly that the penalty of death be suspended. He opposed the national renunciation of Christianity, and was the first to advocate the reopening of the churches; exerted himself to get measures put in execution for restraining the vandalistic fury against the monuments of art; extended his protection to artists and men of letters, and obtained for them pecuniary encouragement from the state; and devoted much of his attention to the reorganization of the public libraries, the establishment of botanic gardens, and the improvement of technical education. He also took a great interest in negro emancipation, and on his motion men of color in the French colonies were admitted to the same rights as whites. On the establishment of the new constitution, Grégoire was elected to the council of 500, and after the 18th Brumaire he became a member of the new legislative assembly. In this capacity he voted in the minority of five against the proclamation of the empire, and opposed the creation of the new nobility and the

divorce of Napoleon from Josephine; but notwithstanding this he was subsequently created a count of the empire and officer of the legion of honor. During the later years of Napoleon's reign he traveled in England and Germany, but in 1814 he had returned to France and was one of the chief instigators of the action that was taken against the empire. After the second restoration he was excluded from the Institute, and when in 1819 he was elected to the assembly by the department of Isère, his election was annulled. From that time, therefore, he lived in retirement, occupying himself in literary pursuits and conducting a voluminous correspondence with most of the eminent savants of Europe; but as he had been deprived of his bishopric and of his pension as a senator, he was compelled to sell his library to obtain the means of support. He died at Paris, May 20, 1831.

GREGORIAN CHANT. See PLAINSONG.

GREGORAS, NICEPHORUS. See BYZANTINE HISTORIANS.

GREGORY, ST., surnamed THE GREAT, the first pope of that name, and one of the four doctors of the Latin Church (Ambrose, Augustine, and Jerome being the other three), was born at Rome about the year 540. His father Gordianus possessed senatorial rank, and his mother Sylvia is said to have been remarkable for her mental endowments. Educated for the legal profession, Gregory about his thirtieth year was chosen by the citizens to the high position of praetor urbanus; this post he is said to have occupied for three years (571-574). About 578 or 579 he was appointed abbot of his monastery, and likewise one of the seven deacons (regionarii) of the Roman Church; and in 582 he was sent by Pelagius II. to Constantinople as papal apocrisarius or responsalis at the imperial court. There he found time to begin, if not to complete, one of his large works, the *Moralia*, or exposition of the book of Job. A few years after his return from the eastern capital, the death of Pelagius (590) caused a vacancy in the papal chair, and the choice of the clergy, senate, and people unanimously fell upon Gregory. The pontificate of fourteen years which followed was marked by extraordinary vigor and activity, which made themselves felt throughout almost every department of the doctrine, discipline, and worship of the entire Western Church. The aggressions of the Lombards were checked, and order and tranquillity were speedily restored to Rome; in Italy and France he tightened the too long relaxed reins of ecclesiastical discipline; in England, Spain, and Africa the powers of Paganism, Arianism, and Donatism were perceptibly weakened; as against the eastern emperor and patriarch of Constantinople the prerogatives of the bishop of Rome were asserted with a vigor previously unattested; the ceremonies of the church were regulated and extended, the liturgy further developed. The anniversary of Gregory's death, which took place at Rome on March 12, 604, is observed as a duplex by the Latin Church, and even in the Greek Church his wisdom and sanctity continue to be commemorated.

GREGORY II., ST., pope from 715 or 716 to 731, succeeded Constantine I. Having, it is said, bought off the Lombards for thirty pounds of gold, he used the tranquillity thus obtained for vigorous missionary effort in Germany, and for strengthening the papal authority in the churches of England and Ireland. By excommunicating Leo the Isaurian, he prepared the way for a long series of revolts and civil wars, which tended greatly to the establishment of the temporal power of the popes. He died in 731, and subsequently attained the honor of canonization, February 13th being the day consecrated to his memory in the *Martyrology*.

GREGORY III., ST., pope from 731 to 741, a

Syrian by birth, succeeded Gregory II. in March, 731. His pontificate, like that of his predecessor, was disturbed by the iconoclastic controversy, in which he vainly invoked the intervention of Charles Martel. During his reign also Boniface in Germany, on whom he conferred the pallium, Wilibald in Bohemia, and Bede in England carried on their most successful missionary labors. He died November 29, 741, and was succeeded by Zacharias I.

GREGORY IV., pope from 827 to 844, was chosen to succeed Valentinus in December, 827, on which occasion he recognized the supremacy of the Frankish emperor in the most unequivocal manner. His name is chiefly associated with the quarrels between Lothaire and Louis the Debonaire, in which he espoused the cause of the former, for whom, in the Campus Mendacii, as it is usually called (833), he secured by his treachery a temporary advantage. The institution of the feast of All Saints is usually attributed to this pope. He died January 25, 844, and was succeeded by Sergius II.

GREGORY V., pope from 996 to 999, a grandson of the emperor Otho the Great, succeeded John XV. when only twenty-four years of age, and until the council of Pavia (997) had a rival in the person of the antipope John XVI., whom the people of Rome in revolt against the will of the youthful emperor Otho III., Gregory's cousin, had chosen. The most memorable acts of his pontificate were those arising out of the contumacy of the French king, Robert, who was ultimately brought to submission by the rigorous infliction of a sentence of excommunication. He died suddenly, and not without suspicion of foul play, February 18, 999. His successor was Silvester II.

GREGORY VI., pope from 1044 to 1046, who as Johannes Gratianus had earned a high reputation for learning and probity, succeeded Benedict IX., having bought off the antipopes Sylvester III. and John XX. In a council held by the emperor Henry III., at Sutri, in 1046, he was accused of simony, and his election was found to have been informal. This led to his degradation, and was followed by his withdrawal into Germany, where he died in the following year (1047). He was succeeded by Clement II.

GREGORY VII., ST., one of the greatest of the Roman pontiffs, was born about the year 1015 at Soano or Saona, a small town in Tuscany, where his father is said to have followed the trade of a carpenter. His own name, Hildebrand or Hellebrand, is suggestive of a German extraction; but of his remoter ancestry nothing is recorded. There is some reason to believe that, after passing his novitiate in Rome, Hildebrand removed for some years to Clugny; but all the earlier years of his life are involved in considerable obscurity. In 1046 he became one of the chaplains of the newly elected pope, Gregory VI., whom he shortly afterward accompanied into his German exile; and on the death of that pontiff, some two years later, he retired to Clugny, where his learning and sanctity made a deep impression, and where, according to some accounts, he was ultimately promoted to the office of prior. As a monk of Clugny he appears to have oftener than once visited the imperial court for the transaction of ecclesiastical business; and in 1049 he is said in a very special way to have come under the notice of Bruno, bishop of Toul, then on his way to Rome to take possession of the chair of St. Peter, which he occupied for some years under the title of Leo IX. It was at Hildebrand's instance that Bruno, who had been nominated by the emperor merely, consented to refrain from assuming the pontifical vestments, and to present himself to the Romans in the garb of a simple pilgrim, until he should have

been elected in a more regular manner. The ascendancy which Hildebrand had thus acquired over this pope he never afterward lost; in 1050 he became cardinal subdeacon, and in following years he was intrusted with various missions of great importance, taking also a prominent part in the important synods of Rheims and Mainz, as well as in those of Rome. On the death of Leo IX. in 1054 the Roman people had signified a desire that the subdeacon should succeed him; this honor and responsibility, however, Hildebrand declined; but he was one of three legates who went to Germany to consult with the emperor about the choice of a successor. The negotiations, which lasted eleven months, ultimately issued in the election of Gebhard of Eichstätt, a relative of the emperor, who up to that time had followed a distinctly antipapal policy, but who, immediately after his reception and consecration at Rome as Victor II. (April 13, 1055), became as entirely a tool in the hand of Hildebrand as Leo had been. It was during this pontificate that Hildebrand, as papal legate, attended the French synods held for the purpose of repressing the heresy of Berengarius. On the election of Pope Stephen IX. (X.), Hildebrand was again sent to Germany to defend the choice before the empress Agnes; in this mission, which was ultimately successful, several months were spent. Again, in 1058, he succeeded in defeating the hostile party of Benedict X. and in securing the tiara for Nicholas II.; and once more, in 1061, he successfully labored for the election of Alexander II. to the papal chair. At length, in 1073, on the death of Alexander, Hildebrand was himself compelled by the tumultuous demands of the mob to accept the vacant tiara (April 22d); but he refused to receive consecration until the sanction of the emperor had been obtained. This did not arrive for more than a month, although meanwhile he had been practically exercising many of the papal functions; finally, however, he was ordained to the priesthood, and some days afterward (June 30th), solemnly consecrated pope by the title of Gregory VII., a name which he chose in testimony of his veneration for the memory and character of his earliest patron, Gregory VI. Once firmly established on the papal throne, Gregory lost no time in giving the utmost possible practical effect to the two leading ideas of his life, the establishment of the supremacy of the papacy within the church and the effective assertion of the supremacy of the church over the state. In March, 1074, a synod was held in Rome which condemned the simony that had grown so prevalent throughout the church, and also enacted the old stringent laws of celibacy which had become almost a dead letter, especially in Germany and in the north of Italy; simoniacal or married priests were declared to be deposed and their priestly functions invalid. The resistance of the clergy to these decrees was utterly in vain; papal legates visited every country, and, supported by the popular voice, compelled submission. At a second synod held in Rome in February, 1075, the decrees of the first were confirmed, and the first blow was struck, which afterward resulted in the long protracted wars of investitures. The decree was aimed immediately at certain German bishops, Henry's personal advisers, but hardly less directly at Henry himself. The emperor, finding his hands at the moment fully occupied with the suppression of a revolt among the Saxons, was politic enough to conceal his resentment for the time, and to dismiss his advisers; but as soon as the war had been brought to a close, his defiance found ample expression. Meanwhile Gregory was not unopposed even in Italy, and during the Christmas festivities of 1075 a revolt in Rome itself was organized by Cencius, who had placed himself at the head of those

nobles who were opposed to reform; the pope, however, had the popular enthusiasm on his side, and ultimately the insurgents were compelled to fly. A papal embassy was next sent, early in 1076, to Henry at Goslar, citing him to appear personally at Rome at a council to be held in the second week of Lent, and there answer for his simony, sacrilege, and oppression. Henry's rage at this knew no bounds; he dismissed the legates with insult, and at the diet held at Worms (January 24, 1076,) replied by declaring Gregory deposed on charges of tyranny, magic and adultery, by sending notification of this fact to the Roman clergy, and by taking steps for appointing a successor to the dethroned pontiff. Gregory now lost no time in excommunicating all the bishops who had attended the diet of Worms, in solemnly deposing and excommunicating the emperor, and in absolving his subjects from their oath of allegiance (February 22, 1076). This counter action produced a powerful effect upon the German princes and people, many of whom had had good cause to resent Henry's tyrannies; one by one the bishops who had announced their withdrawal from Gregory's obedience now signified their contrition, and at a diet held at Tribur (September, 1076) the election of a new emperor began to be discussed. Resistance being in the meantime impossible, Henry resolved upon humbling himself to the utmost; in the dead of winter he set out to make his submission; Gregory was in waiting for him at Canossa, where (January 25 to 27, 1077) that famous penance which Europe has not yet forgotten was imposed. Absolved only on condition of his not assuming the royal dignity till his case had been investigated and decided, Henry had no sooner left the papal presence than he began to plot his revenge. Throwing himself upon the generosity of his Lombard vassals, he took courage to face the papal excommunication, which was renewed in November, 1078; and in the wars which ensued his arms were finally successful. Rudolf of Swabia having died soon after the battle of Merseburg, in 1080, the emperor proceeded with a powerful army to escort into Italy Guibert of Ravenna, who had been chosen at Brixen (June, 1080) as Gregory's successor. In three successive summers the attack on Rome was renewed, but it was not until 1084 (March 21st) that the treachery of some of the nobles of the city opened the gate to the invader. Gregory was now at last compelled to take refuge in the castle of St. Angelo, while Guibert was established on the pontifical throne as his successor, with the title of Clement III. After receiving coronation from Clement, Henry determined to return at once to Germany, especially as Robert Guiscard was known to be approaching. Released accordingly by the arrival of the Norman duke, Gregory excommunicated once more both Henry and Clement; but not deeming himself secure at Rome, where he had reason to know that his power was no longer what it once had been, he in May, 1084, placed himself under Robert's protection at Salerno, where he died May 25, 1085, after a comparatively brief pontificate of not much more than ten years. His last words are reported to have been, "I have loved righteousness and hated iniquity, and therefore I die in exile." His festival is observed throughout the Roman Church on the anniversary of his death. His successor was Victor III.

GREGORY VIII. (Albert de Mora), who was papal legate, had in 1172 attended the council of Avranches, which absolved Henry II. of England from the guilt of the murder of Thomas à Beckett, was consecrated pope in room of Urban III., October 25, 1187, and died of fever on December 17th of the same year. Clement III. was his successor.

GREGORY IX., pope from 1227 to 1241, the suc-

cessor of Honorius III., fully inherited the traditions of Gregory VII. and of his uncle Innocent III., and zealously gave himself up to the perpetuation of their policy. One of the first acts of his pontificate was to suspend the Emperor Frederick II., then lying sick at Otranto, for dilatoriness in carrying out his promised crusade; the suspension was followed by excommunication and threats of deposition after Frederick had written to the sovereigns of Europe complaining of his treatment. A consequent invasion of the patrimony of St. Peter at the instance of Frederick in 1228 having proved unsuccessful, the emperor was constrained to give in his submission and beg for absolution. Although peace was thus secured (August, 1230) for a season, the Roman people were far from satisfied; driven by a revolt from his own capital in July, 1232, the pope was compelled to take refuge at Anagni and invoke the aid of Frederick. A new outbreak of hostility led to a fresh excommunication of the emperor in 1239, and to a prolonged war which was only terminated by the death of Gregory (August 22, 1241). Gregory IX., was succeeded by Celestine IV.

GREGORY X., pope from 1271 to 1276, succeeded Clement IV. after the papal chair had been three years vacant; his election occurred while he was engaged in a pilgrimage to Saint Jean-d'Acre. On his arrival at Rome his first act was to summon the council which met at Lyons in 1274 for the purpose of considering the Eastern schism, the condition of the Holy Land, and the abuses of the Catholic Church. It was while returning from that council that he died at Arezzo on January 10, 1276. To him is due the bull which, subsequently incorporated into the code of canon law, continues to regulate all conclaves for papal elections. He was succeeded by Innocent V.

GREGORY XI. (Pierre Roger de Beaufort), pope from 1370 to 1378, born in Limousin in 1336, succeeded Urban V. in 1370 as one of the Avignon popes. During his pontificate vigorous measures were taken against the "heresies" which had broken out in Germany, England and other parts of Europe; a sincere effort was also made to bring about a reformation in the various monastic orders. His energy was largely stimulated by the stirring words of Catherine of Siena, to whom in particular the transference of the papal see back to Italy, January 27, 1377, was almost entirely due. He did not long survive this removal, dying on March 27, 1378. His successor was Urban VI., but the antipope Clement VII. also received much support, and the schism lasted forty years.

GREGORY XII. (Angelo Corario or Corrarò), pope from 1406 to 1409, born at Venice about 1326, succeeded Innocent VII. on November 30, 1406, having been chosen at Rome by a conclave consisting of only fifteen cardinals, under the express condition that, should Benedict XIII. of Avignon renounce all claim to the papacy, he also would renounce his, so that a fresh election might be made by the no longer divided church. Along with Benedict he was deposed by the council of Pisa in March, 1409, as schismatical, heretical, perjured and scandalous; but it was not till after the council of Constance had set aside John XXIII. (1415) that through his ambassador he formally renounced the title and dignity of lawful pope. The rest of his life was spent in peaceful obscurity as cardinal-bishop of Porto and legate of the mark of Ancona. He died October 18, 1417, having been succeeded in 1409 by Alexander V.

GREGORY XIII. (Ugo Buoncompagno), pope from 1572 to 1585, was born February 7, 1502, at Bologna, where he studied law and graduated in 1530, and afterward taught jurisprudence for some years,

Alexander Farnese and Charles Borromeo being among his pupils. At the age of thirty-six he was summoned to Rome by Paul III., under whom he held successive appointments as first judge of the capital, abbreviator, and vice-chancellor of the campagna; by Paul IV. he was attached as datarius to the suit of Cardinal Carafa; and by Pius IV. he was created cardinal priest and sent to the council of Trent. On the death of Pius V. in May, 1572, the choice of the conclave fell upon Buoncompagno, who assumed the name of Gregory XIII. His intervention in the affairs of Britain through Ireland and by means of his tool, Philip II., and also the league which he sought to cement against France (the massacre of the St. Bartholomew had taken place in September, 1572), are matters which belong to the histories of those countries. In order to raise funds for these and similar objects, he confiscated a large proportion of the houses and properties throughout the states of the church,—a measure which enriched his treasury, indeed, for a time, but by alienating the great body of the nobility and gentry, revived old factions, created new ones, and ultimately plunged his temporal dominions into a state bordering upon anarchy. Such was the position of matters at the time of his death, which took place April 10, 1585.

GREGORY XIV. (Niccolò Sfondrato), pope from 1590 to 1591; a native of Cremona, succeeded Urban VII., December 5, 1590. His brief pontificate was marked by no important occurrence, except that, instigated by the king of Spain and the duke of Mayenne, he excommunicated Henry IV. of France, declaring him, as a heretic and persecutor, to be deprived of his dominions, and also levied an army for the invasion of France. He was succeeded by Innocent IX.

GREGORY XV. (Alessandro Ludovisio), pope from 1621 to 1623, born at Bologna in 1554, succeeded Paul V. on February 9, 1621. Beyond assisting the German emperor against the Protestants, and the king of Poland against the Turks, he interfered little in European politics. He was a learned divine and manifested a reforming spirit; and his pontificate was marked by the canonization of St. Theresa, Francis Xavier, Ignatius Loyola, and Philip Neri. He died on July 18, 1623, and was succeeded by Urban VIII.

GREGORY XVI. (Bartolommeo Alberto Cappellari), pope from 1831 to 1846, was born at Belluno on September 18, 1765, and at an early age entered the order of the Camaldoli, among whom he rapidly gained distinction for his theological and linguistic acquirements. His first appearance before a wider public was in 1799, when he published against the Italian Jansenists a controversial work, which, besides passing through several editions in Italy, was translated into several European languages. In 1800 he became a member of the Academy of the Catholic Religion, founded by Pius VII. When Pius VII. was carried off from Rome in 1809, Cappellari withdrew to the monastery of San Michele at Murano, near Venice, and in 1814, with some other members of his order, he removed to Padua; but soon after the restoration of the pope he was recalled to Rome, where he received successive appointments as vicar-general of the Camaldoli, counselor of the Inquisition, prefect of the Propaganda, and examiner of bishops. In March, 1825, he was created cardinal by Leo XII., and shortly afterward was intrusted with an important mission to adjust a concordat regarding the interests of the Catholics of Belgium and the Protestants of Holland. On February 2, 1831, he was, after sixty-four days' conclave, unexpectedly chosen to succeed Pius VIII. in the papal chair. The revolution of 1830 had just inflicted a severe blow on the ecclesiastical party in France, and it

seemed as if similar disasters to the papal cause were imminent in other parts of Europe, when Gregory XVI. entered upon his fifteen years' pontificate. Almost the first act of the new Government of France was to unfurl the tricolor at Ancona; and the immediate effect was to throw all Italy, and particularly the Papal States, into a state of excitement such as seemed to call for strongly repressive measures. In the course of the struggle which ensued, the temporal reign of Gregory was marked accordingly by executions, banishments, imprisonments, to an extent which makes it impossible for the candid reader to absolve him from the charges of cruelty and bigotry which were so frequently raised at the time. The embarrassed financial condition in which he left the States of the Church also makes it doubtful how far his lavish expenditure in architectural and engineering works, and his magnificent patronage of learning in the hands of Mai, Mezzofanti, and others, were for the real benefit of his subjects. The years of his pontificate were marked by the steady development and diffusion of those ultramontane ideas which were ultimately formulated under the presidency of his successor Pius IX. by the council of the Vatican. He died June 1, 1846.

GREGORY, ST., THE ILLUMINATOR, the founder and patron saint of the Armenian Church, was born about 257 A.D. He belonged to the royal race of the Arsacides, being the son of a certain Prince Anak, who assassinated Chosroes of Armenia, and thus brought ruin on himself and his family. Educated by a Christian nobleman, Euthalius, in Cæsarea in Cappadocia, Gregory sought, when he came to man's estate, to introduce the Christian doctrine into his native land. At that time Tiridates I., a son of Chosroes, sat on the throne, and, influenced partly it may be by the fact that Gregory was the son of his father's enemy, he subjected him to much cruel usage, and imprisoned him for fourteen years. But vengeance and madness fell on the king, and at length Gregory was called forth from his pit to restore his royal persecutor to reason by virtue of his saintly intercession. The cause of Christianity was now secured; king and princes and people vied with each other in obedience to Gregory's instruction, and convents, churches and schools were established. Gregory in 302 received consecration as patriarch of Armenia from Leontius of Cæsarea and in 318 he appointed his son Aristax to be his successor. About 331 he withdrew to a cave in the mountain Sebu in the province of Daranalia in Upper Armenia, and there he died a few years afterward unattended and unobserved. When it was discovered that he was dead his corpse was removed to the village of Thordanum or Thortan. The remains of the saint were scattered far and near in the reign of Zeno. His head is said to be now in Italy, his right hand at Etchmiadzin, and his left at Sis.

GREGORY, ST., OF NAZIANZUS, surnamed THEOLOGUS, one of the four great fathers of the Eastern Church, was born about the year 329 A.D., at or near Nazianzus, Cappadocia. The events which were at that time stirring the political and ecclesiastical life of Cappadocia, and indeed of the whole Roman world, made a career of learned leisure difficult if not impossible to a man of Gregory's position and temperament. The emperor Constantius, having by a course of artful intrigue and intimidation succeeded in thrusting a semi-Arian formula upon the Western bishops assembled at Ariminum in Italy, had next attempted to follow the same course with the Eastern episcopate. The aged bishop of Nazianzus having yielded to the imperial threats, a great storm arose among the monks of the diocese, which was only quelled by the influence of the

younger Gregory, who shortly afterward (about 361) was ordained to the priesthood. After a vain attempt to evade his new duties and responsibilities by flight, he appears to have continued to act as a presbyter in his father's diocese without interruption for some considerable time; and it is probable that his two *invektives* against Julian are to be assigned to this period. Subsequently (about 372), under a pressure which he somewhat resented, he allowed himself to be nominated by Basil as bishop of Sasima. Toward 378-9 the small and depressed remnant of the orthodox party in Constantinople sent him an urgent summons to undertake the task of resuscitating the Catholic cause, so long persecuted and borne down by the Arians of the capital. The fame of Gregory as a learned and eloquent disciple of Origen, and still more of Athanasius, pointed him out as such a champion; nor could he resist the appeal made to him, although he took the step sorely against his will. Once arrived in Constantinople, he labored so zealously and well that the orthodox party speedily gathered strength; and the small apartment in which they had been accustomed to meet was soon exchanged for a vast and celebrated church which received the significant name of Anastasia, the Church of the Resurrection. He continued to labor in the Eastern capital till the arrival of Theodosius, and the visible triumph of the orthodox cause; the metropolitan see was then conferred upon him, and after the assembling of the second oecumenical council in 381 he received consecration from Meletius. The rest of his days were spent partly at Nazianzus, where he appears still to have mixed himself in ecclesiastical affairs, and partly on his patrimonial estate at Arianzus, where he devoted himself to his favorite literary pursuits, and especially to poetical composition, until his death, which occurred in 389 or 390.

GREGORY, ST., OF NYSSA, one of the great Cappadocians, and designated by one of the later oecumenical councils as "a father of fathers," was a younger brother of St. Basil, and was born (probably) at Neocæsarea about 331 A.D. At a comparatively early age he entered the church, and held for some time the office of anagnost or reader; subsequently he manifested a desire to devote himself to the secular life as a rhetorician; but this impulse was checked by the earnest remonstrances of Gregory Nazianzen. Finally, in 371 or 372 he was ordained by his brother Basil to the bishopric of Nyssa, a small town in Cappadocia. His strict orthodoxy on the subject of the Trinity and the Incarnation, together with his vigorous eloquence, combined to make him peculiarly obnoxious to the Arian faction, which was at that time in the ascendant through the protection of the emperor Valens; and in 375, on the ground of the alleged irregularities in his election, and in the administration of the finances of his diocese, he was driven into exile, whence he did not return till the publication of the edict of Gratian in 378. Shortly afterward he took part in the proceedings of the synod which met at Antioch in Caria, principally in connection with the Meletian schism. At the great oecumenical council held at Constantinople in 381, he was a conspicuous champion of the orthodox faith; according to Nicephorus, indeed, the additions made to the Nicene creed were entirely due to his suggestion, but this statement is of doubtful authority. That his eloquence was highly appreciated is shown by the facts that he pronounced the discourse at the consecration of Gregory of Nazianzus, and that he was chosen to deliver the funeral oration on the death of Meletius the first president of the council. In the following year, moreover (382), he was commissioned by the council to inspect and set in order the churches of Arabia, in com-

nection with which mission he also visited Jerusalem. The exact date of his death is unknown; some authorities refer it to 396, others to 400.

GREGORY, ST., surnamed in later ecclesiastical tradition THAUMATURGUS (the miracle-worker), was born of noble and wealthy heathen parents at Neocæsarea, toward the beginning of the third century of the Christian era. His original name was Theodorus. Destined by his parents for the bar, he studied civil law at Athens, Alexandria, and Berytus. It is said; he afterward (about 231) accompanied his sister to Cæsarea in Palestine, where he became the pupil and finally the convert of Origen. In returning to Cappadocia, some five years after his conversion, it had been his original intention to live a retired ascetic life, but this wish he was not permitted to gratify. Urged by Origen, and at last almost compelled by Phædimus of Amasia, his metropolitan, neither of whom was willing to see so much learning, piety, and masculine energy practically lost to the church, he, after many attempts to evade the dignity, was consecrated bishop of his native town (about 240). His episcopate, which lasted some thirty years, was characterized by great zeal, and by so much success that, according to the (doubtless somewhat rhetorical) statement of Gregory of Nyssa, whereas at the outset of his labors there were only seventeen Christians in the city, there were at his death only seventeen persons in all who had not embraced Christianity. Gregory is believed to have died in the reign of Aurelian, about the year 270, though some accounts place his death six years earlier.

GREGORY, ST. OF TOURS (c. 540-594), historian of the Franks, was born at Clermont, Auvergne, not earlier than 539 and not later than 543 A.D. He was the youngest son of Florentius, a provincial senator, and head of one of the oldest and most powerful Christian families in the country; at his baptism he received the name of George, that of Gregory not having been assumed until his consecration, at least thirty years afterward. Having been ordained a deacon on attaining the canonical age, the youthful Georgius Florentius for a time attended in some ecclesiastical capacity the court of Sigebert of Austrasia; and when in 573 a vacancy occurred in the see of Tours, which had been occupied by many of his kindred, his reputation for piety and wisdom led to his being immediately designated as a suitable successor to that bishopric. In 581 he took a leading part in adjusting that arrangement between Chilperic and Childebert which gave peace to France for many years. He died at Tours on November 17, 594, and subsequently attained the honors of beatification and canonization, his day in the calendar being November 17th.

GREGORY, the name of a Scottish family, many members of which attained high eminence in various departments of science, sixteen having held professorships. Of the most distinguished of their number a notice is given below.

DAVID GREGORY (1628-1720), eldest son of the Rev. John Gregory of Drumoak, Aberdeenshire, was born in 1628. For some time he was connected with a mercantile house in Holland, but on succeeding to the family estate of Kinardie he returned to Scotland, and occupied most of his time in scientific pursuits, freely giving his poorer neighbors the benefit of his medical skill. He is said to have been the first possessor of a barometer in the north of Scotland; and on account of his success by means of it in predicting changes in the weather, he was accused of witchcraft before the presbytery of Aberdeen, but he succeeded in convincing that body of his innocence. He died in 1720.

JAMES GREGORY (1638-1675), the author of important discoveries in mathematics and optics, younger

brother of the preceding, was born in 1638. At an early period he manifested a strong inclination and capacity for mathematics and kindred sciences; and before completing his twenty-third year he published his famous treatise *Optica Promota*, in which he made known his great invention the Gregorian reflecting telescope. About 1665 he went to the university of Padua, where he studied for some years, and in 1667 published *Vera Circuli et Hyperbolæ Quadratura*, in which he propounded his method of an infinitely converging series for the areas of the circle and hyperbola. On his return to England in this year he was elected a member of the Royal Society; in the following year he became professor of mathematics in the university of St. Andrews; and in 1674 he was transferred to the chair of mathematics in Edinburgh. In October, 1675, while showing the satellites of the planet Jupiter to some of his students through one of his telescopes, he was suddenly struck with blindness; and he died a few days afterward at the early age of thirty-seven.

DAVID GREGORY (1661-1708), nephew of the preceding and son of the David Gregory above mentioned, was born in Aberdeen in 1661. He was educated partly in his native city and partly in Edinburgh, where at the age of twenty-three he became professor of mathematics. In 1691 he was appointed Savilian professor of astronomy at Oxford, an office which he held till his death in 1708. He was succeeded in the chair of mathematics in Edinburgh by his brother James; another brother, Charles, was in 1707 appointed professor of mathematics in the university of St. Andrews; and his eldest son, David, became professor of modern history at Oxford, and canon and latterly dean of Christ Church.

JOHN GREGORY (1724-1773), professor of medicine in the university of Edinburgh, grandson of James Gregory, the inventor of the Gregorian telescope, and youngest son of Dr. James Gregory, professor of medicine in King's College, Aberdeen, was born at Aberdeen, June 3, 1724. After studying at the grammar school of Aberdeen, and completing his literary course at King's College in that city, he attended the medical classes at Edinburgh university. In 1745 he went to Leyden to complete his medical studies, and during his stay there he received without solicitation the degree of doctor of medicine from King's College, Aberdeen. On his return from Holland he was elected professor of philosophy at King's College, but in 1749 he resigned his professorship on account of its duties interfering too much with his practice as a physician. In 1754 he proceeded to London, in 1764 removed to Edinburgh, and died in 1773.

JAMES GREGORY (1753-1821), professor of the practice of medicine in the university of Edinburgh, eldest son of the preceding, was born at Aberdeen in 1753, accompanied his father to Edinburgh in 1764, and after going through the usual course of literary studies at that university, was for a short time a student at Christ Church, Oxford. He entered on the study of medicine at Edinburgh, and, after graduating doctor of medicine in 1774, spent the greater part of the next two years in Holland, France and Italy. Shortly after his return to Scotland he was appointed in 1776 to the chair his father had formerly held, and in the following year he also entered on the duties of teacher of clinical medicine in the Royal Infirmary. On the illness of Doctor Cullen in 1790, he was appointed joint professor of the practice of medicine; he became sole professor on the death of Doctor Cullen in the same year; and he continued to deliver lectures on that subject to audiences almost regularly increasing, until his last illness in 1821. He died on April 2d of that year.

WILLIAM GREGORY (1803-1858), son of the preceding, was born December 25, 1803. In 1837 he became professor of chemistry at the Andersonian Institution, Glasgow, in 1839 at King's College, Aberdeen, and in 1844 at Edinburgh University. He died April 24, 1858.

DUNCAN FARQUHARSON GREGORY (1813-1844), brother of the preceding, was born April 13, 1813. After studying at the university of Edinburgh he in 1833 entered Trinity College, Cambridge, where he was for a time assistant professor of chemistry, and was one of the founders of the chemical society. He latterly devoted his chief attention to mathematics, in which he made some important discoveries. He died February 23, 1844.

GREGORY, OLINTHUS, LL.D. (1774-1841), was born January 29, 1774, at Yaxley, Huntingdonshire. He was only nineteen when he published *Lessons Astronomical and Philosophical* (1793), and soon after by a manuscript on the *Use of the Sliding Rule*, he was fortunate enough to excite the interest of Doctor Hutton, professor of mathematics at the Royal Military Academy of Woolwich. Having settled at Cambridge in 1798, Gregory first acted as subeditor of a provincial newspaper, and then opened a bookseller's shop; but before long he found that he would be better off as a private teacher of mathematics. In 1802 he obtained an appointment as mathematical master at Woolwich through the influence of Hutton; and when Hutton resigned in 1807, Gregory succeeded him in the professorship. Failing health obliged him to retire in 1838, and he died at Woolwich February 2, 1841.

GREIFENBERG, the chief town of a circle in the Prussian province of Pomerania and government of Stettin, is situated on the Rega, forty-five miles northeast of Stettin. Population about 7,000.

GREIFENHAGEN, the chief town of a circle in the Prussian province of Pomerania and government of Stettin, is situated on the Reglitz, twelve miles southwest of Stettin. Population about 8,000.

GREIFSWALD, or **GREIFSWALDE**, the chief town of a circle in the Prussian province of Pomerania and government of Stralsund, is situated on the Ryck, three miles from its mouth in the Baltic, and twenty miles south-by-east of Stralsund. Population (1901), 25,000.

GREIZ, or **GREITZ**, a town of Germany, capital of the principality of Reuss-Greiz, is situated in a pleasant valley on the right bank of the White Elster, near the borders of Saxony, and fourteen miles west-by-south of Zwickau. Population (1900), 22,346.

GRENADA, the most southern island of the Antilles. It is thirty leagues southwest of Barbados, and about sixty miles from the nearest point of South America. Its length from north to south is about twenty-four miles, and its greatest breadth is twelve miles. The area is 133 square miles. Population (1900), about 65,523.

The soil is extraordinarily fertile; but cotton, indigo, and tobacco are not now cultivated. Fruits and some kinds of European vegetables grow luxuriantly. Sugar cultivation is not extending, but cocoa is now making rapid strides. The island is divided into six parishes. Formerly it had a house of assembly, but is now an English crown colony under the general government of the Windward Islands. It has a lieutenant-governor and a council consisting of officials and members nominated by the crown.

The capital, St. George's (population, about 5,000), is built upon a peninsula projecting into a spacious bay on the west side of the island, near the southern extremity. The houses are of brick or stone, and stand on high ground which rises from the bay.

GRENOBLE, a fortified city of France, formerly the chief town of Dauphiné and now of the department of the Isère. With the exception of its more modern portions, the town of Grenoble is characterized by the tortuous and crowded streets usual in places that have long been confined within strong fortifications. The cathedral of Notre Dame, a vast brick building of various periods from the tenth to the seventeenth century, the foundation of which is traditionally ascribed to Charles the Great; the church of St. Laurence, with a remarkable crypt of the eleventh century, long believed to be an old temple of Æsculapius; and the church of St. André, founded by the dauphin Guigues André about 1220, and frequently visited for the sake of the tomb of Bayard removed thither in 1822, are the most noteworthy of the ecclesiastical edifices. The palais de justice is a striking erection of the fifteenth and sixteenth centuries occupying the site of the old castle of the dauphins, and in front is a statue of Bayard dating from 1823. Population, (1901), 68,052.

GRENVILLE, GEORGE, an English statesman, second son of Richard Grenville and Hester Temple, afterward Countess Temple, was born October 14, 1712. He was educated at Eton and at Christ Church, Oxford, and in his twenty-fifth year was called to the bar. He entered parliament in 1741 as member for Buckingham, and continued to represent that borough till his death in 1770. In December, 1744, he became a lord of the admiralty, in June, 1747, a lord of the treasury, and in 1754, treasurer of the navy and privy counselor. He remained in office in 1761, when his brother, Lord Temple and his brother-in-law Pitt resigned upon the question of the war with Spain, and in the administration of Lord Bute he was intrusted with the leadership of the House of Commons. In May, 1762, he was appointed secretary of state, and in October, first lord of the admiralty; and in April, 1763, he became first lord of the treasury and chancellor of the exchequer. The most prominent measures of his administration were the prosecution of Wilkes and the passing of the American Stamp Act, which led to the first symptoms of alienation between America and the mother country. During the latter period of his term of office he was on a very unsatisfactory footing with the young king George III., who gradually came to feel a kind of horror of the interminable persistency of his conversation, and whom he endeavored to make use of as the mere puppet of the ministry. The king made various attempts to induce Pitt to come to his rescue by forming a ministry, but without success, and at last had recourse to the marquis of Rockingham, on whose agreeing to accept office Grenville was dismissed July, 1765. He never again held office, and died November 13, 1770.

GRENVILLE, WILLIAM WYNDHAM GRENVILLE, LORD, English statesman, son of the preceding, was born October 25, 1759. In February, 1782, he was elected a member of parliament for the county of Buckingham, and in the September following he became secretary to his brother the marquis of Buckingham, who had been named lord-lieutenant of Ireland. On the overthrow of the cabinet of Lord Shelburne in the following year he returned to England, and in December he was appointed, by his cousin, Pitt, paymaster-general of the forces. In 1789 he was chosen speaker of the house of commons, but he vacated the chair in the same year, and was transferred to the upper house with the title of Lord Grenville, on being appointed secretary of state. He exchanged this office in 1791 for that of secretary of foreign affairs, being regarded by Pitt as the person best fitted to carry out his policy in reference to France. Along with Pitt he resigned office in 1801, on account of the king declining to grant any

concessions to the Catholics; and when Pitt, on accepting office in 1804, did not stipulate for Catholic emancipation, he declined to join his ministry, and entered into a close alliance with Fox. On the death of Pitt in 1806 he became the nominal head of the government of "All the Talents," whose military projects resulted very unsuccessfully, but which deserves to be remembered with honor on account of the act for the abolition of the slave trade. In 1819, when the marquis of Landsdowne brought forward his motion for an inquiry into the cause of distress and discontent in the manufacturing districts, Grenville delivered an alarmist speech, in which he advocated the adoption of severely repressive measures. He died January 12, 1834.

GRESHAM, SIR THOMAS, a London merchant, the founder of the Royal Exchange and of Gresham College, London, was born in 1519.

Under Queen Elizabeth, besides continuing to act as financial agent of the crown, he was for some time ambassador at the court of the duchess of Parma. In 1559 he received the honor of knighthood. By the outbreak of the war in the Low Countries he was compelled to leave Antwerp on March 19, 1567; but, though he spent the remainder of his life in London, he continued his business as merchant and financial agent of the government in much the same way as formerly. In 1565 Gresham made a proposal to the court of aldermen of London to build, at his own expense, a bourse or exchange, on condition that they purchased for this purpose a piece of suitable ground. In this proposal he seems to have had an eye to his own interest as well as to the general good of the merchants, for by a yearly rental of £700, obtained for the shops in the upper part of the building, he received a sufficient return for his trouble and expense. Gresham died suddenly, apparently of apoplexy, November 21, 1579.

GRESSET, JEAN BAPTISTE (1709-1777). The literary history of Gresset might be dismissed with the simple statement that he wrote *Vert Vert*. By that one poem he is remembered. His life is, however, interesting from another fact, that he, who almost alone among French poets wrote nothing of which a moralist need be ashamed, spent the last twenty-five years of his life in regretting the frivolity which enabled him to produce the most charming of poems. He published *Vert Vert* at Rouen, being then twenty-four years of age. It is a story, in itself exceedingly humorous, showing how a parrot, the delight of a convent, whose talk was all of prayers and pious ejaculations, was conveyed to another convent as a visitor to please the nuns. On the way he falls among bad companions, forgets his convent language, and shocks the sisters on arrival by profane swearing. He is sent back in disgrace, punished by solitude and plain bread, presently repents, reforms, and is killed by kindness. The story, however, is nothing. The treatment of the subject, the atmosphere which surrounds it, the delicacy in which the little prattling ways of the nuns, their jealousies, their tiny trifles, are presented, takes the reader entirely by surprise. The poem stands absolutely unrivaled, even among French *contes en vers*.

GRÉTRY, ANDRÉ ERNEST MODESTE, a celebrated composer of French opera, was born at Liège, February 11, 1741. He received his first musical education in the *maîtrise* of the college of St. Denis, where his father, a poor musician, occasionally acted as violinist. His first great success was achieved by an Italian intermezzo or operetta, *Le vendémiaire*, composed for the Aliberti theater in Rome, and received with universal applause. It is said that the study of the score of one of Monsigny's operas, lent to him by a secretary of the French embassy in Rome, decided Grétry to devote himself to

French comic opera. On New Year's Day, 1767, he accordingly left Rome, and after a short stay at Geneva (where he made the acquaintance of Voltaire, and produced another operetta) went to Paris. There for two years he had to contend with the difficulties incident to poverty and obscurity. He was, however, not without friends, and by the intercession of one of these, Count Creutz, the Swedish ambassador, Grétry obtained a libretto from the celebrated Marmontel, which he set to music in less than six weeks, and which, on its performance in August, 1768, met with unparalleled success. The name of the opera was *Le Huron*. Two others, *Lucile* and *Le Tableau Parlant*, soon followed, and thenceforth Grétry's position as the leading composer of comic opera was safely established. Grétry died September 24, 1813, at the Hermitage in Montmorency, formerly the house of Rousseau.

GREUZE, JEAN BAPTISTE, in the full tide of the eighteenth century, when professional distinction appeared to be reserved exclusively for those who devoted themselves to the production of historical or allegorical subjects, achieved an immense reputation as a painter of scenes of domestic life. He was born at Tournus in 1725, and is generally said to have formed his own talent; this is, however, true only in the most limited sense, for at an early age his inclinations, though thwarted by his father, were encouraged by a Lyonnese artist named Grandon or Grondom who enjoyed during his lifetime considerable reputation as a portrait-painter. In 1755 Greuze exhibited his *Aveugle Trompé*. Toward the close of the same year he left France for Italy. In 1759, 1761 (*L'Accordée de Village*, — Louvre), and 1763 Greuze exhibited with ever increasing success; in 1765 he reached the zenith of his powers and reputation. In that year he was represented with no less than thirteen works. The Academy took occasion to press Greuze for his diploma picture, the execution of which had been long delayed, and for bade him to exhibit on their walls until he had complied with their regulations. Greuze wished to be received as an historical painter, and produced a work which he intended to vindicate his right to despise his qualifications as a *peintre de genre*. This unfortunate canvas, — *Sevère et Caracalla* (Louvre), — was exhibited in 1769 side by side with Greuze's portrait of Jaurat (Louvre), and his admirable *Petite Fille au Chien Noir*. The Academicians received their new member with all due honors, but at the close of the ceremonies the Director addressed Greuze in these words: — "Monsieur, l'Académie vous a reçu, mais c'est comme peintre de genre; elle a eu égard à vos anciennes productions, qui sont excellentes, et elle a fermé les yeux sur celle-ci, qui n'est digne ni d'elle ni de vous." (Sir, the Academy receives you, but only as a *genre* painter; she having regard for your former productions, which are excellent, and although your eyes are fixed above her, which is creditable neither to her nor in you.) Greuze, greatly incensed, quarreled with his *confrères*, and ceased to exhibit until, in 1804, the Revolution had thrown open the doors of the Academy to all the world. In the following year, on March 4, 1805, he died in the Louvre in great poverty.

GREVILLE, CHARLES CAVENDISH FULKE, was born April 2, 1794. He was one of the pages of George III., and was educated at Eton and Christ Church, Oxford; but he left the university early, having been appointed private secretary to Earl Bathurst before he was twenty. The interest of the duke of Portland had secured for him the secretaryship of the island of Jamaica, which was a sinecure office, the duties being performed by a deputy, and the reversion of the clerkship of the council. Greville entered upon the discharge of the

ties of clerk of the council in ordinary in 1821 and continued to perform them for nearly forty years. He therefore served under three successive sovereigns—George IV., William IV., and Victoria—and although no political or confidential functions are attached to that office, it is one which brings a man into habitual intercourse with the chiefs of all the parties in the state. Well-born, well-bred, handsome, and accomplished, Greville led the easy life of a man of fashion, taking an occasional part in the transactions of his day and much consulted in the affairs of private life. But the celebrity which now attaches to his name is entirely due to the posthumous publication of a portion of a journal or diary which it was his practice to keep during the greater part of his life. These papers were given by him to his friend Mr. Reeve a short time before his death (which took place January 18, 1865), with an injunction that they should be published, as far as was feasible, at not too remote a period after the writer's death. The journals of the reigns of George IV. and William IV. (extending from 1820 to 1837) were accordingly so published in obedience to his directions about ten years after that event. Few publications have been received with greater interest by the public; five large editions were sold in a little more than a year, and the demand in America was as great as in England. These journals were regarded as a faithful record of the impressions made on the mind of a competent observer, at the time, by the events he witnessed and the persons with whom he associated. Their characteristic is the love of truth, of justice, and of sincerity. The court was irritated at the scornful disclosure of the vices and follies of former sovereigns, and fashionable society was annoyed at the writer's absolute indifference to its pretensions. But Greville did not stoop to collect or record private scandal. His object appears to have been to leave behind him some of the materials of history, by which the men and actions of his own time would be judged. He records not so much public events as the private causes which led to them; and perhaps no English memoir-writer has left behind him a more valuable contribution to the history of this century.

GREW, NEHEMIAH (1628-1711), the earliest anatomist and physiologist of England, was the son of Obadiah Grew, nonconformist divine of St. Michael's, Coventry. At the Restoration, his father being ejected from his living, he went to a foreign university, where he took the degree of doctor of physic. Returning to Coventry, his native town, he commenced a series of observations on the physiology of plants, communicating the results to the Royal Society; by which they were so well received that he was induced to remove to London (1672). There he acquired an extensive practice as a physician. He was elected a fellow of the Royal Society on the recommendation of Bishop Wilkins, and in 1677 he succeeded Mr. Oldenburg as secretary, in which capacity he prepared a descriptive catalogue of the rarities preserved at Gresham College (1681). The following year appeared his celebrated work on the *Anatomy of Plants*, in which he displayed great originality as an investigator, especially in pointing out the sex-differences of plants.

GREY, EARL. Charles, second Earl Grey, was the eldest surviving son of General Sir Charles Grey, afterward first Earl Grey. He was born at his father's residence, Fallodon, near Alnwick, March 13, 1764. He was sent to Eton, and thence to Cambridge. Pitt's elevation to the premiership, his brilliant and hard-fought battle in the house, and his complete rout of the Whig party at the general election of 1784, when he came in for Cambridge at the head of the poll, threatened the great territorial interest with nothing less than

extinction. It was to this interest that Grey belonged, and hence, when at length returned for Northumberland in 1786, he at once came forward as a vigorous assailant of the Government of Pitt. He was hailed by the opposition, and associated with Fox, Burke, and Sheridan as a manager in the Hastings impeachment. During the nineteen years which remained of the career of Fox, he followed the great Whig statesman with absolute fidelity, and succeeded him as leader of the party.

When Pitt died in 1806, nothing could prevent the reunited opposition from coming into power, and thus the Broad-bottom ministry was formed under Fox. On his death, Grenville became premier, and Grey, now Lord Howick, Foreign Secretary, and leader of the House of Commons. Disunion, always the bane of English Liberalism, lurked in the coalition, and the Foxites and Grenvillites were only ostensibly at one. When they proposed to concede a portion of the Catholic claims, King George refused, and demanded of them an undertaking never to propose such a measure again. This was refused, and the Grenville-Grey cabinet retired in March, 1807. In the same year Grey's father died, and Grey went to the Upper House. Opposition united Grey and Grenville for a time, but the parties finally split on the old war question. We now reach the principal episode in Grey's career. In 1827 he seem to stand forth the solitary and powerless relic of an extinct party. In 1832 we find that party restored to its old numbers and activity, supreme in parliament, popular in the nation, and Lord Grey at its head. The duke of Wellington's foolish declaration against parliamentary reform, made in a season of great popular excitement, suddenly deprived him of the confidence of the country, and a coalition of the Whigs and Canningites became inevitable. The Whigs had in 1827 supported the Canningites; the latter now supported the Whigs, of whom Grey remained the traditional head. George IV. was dead, and no obstacle existed to Grey's elevation. Grey was sent for by William IV. in November, 1830, and formed a coalition cabinet, pledged to carry on the work in which the duke of Wellington had faltered. But Grey himself was the mere instrument of the times. An old-fashioned Whig, he had little personal sympathy with the popular cause, though he had sometimes indicated a certain measure of reform as necessary. When he took office, he guessed neither the extent to which the Reform Act would go, nor the means by which it would be carried.

The second reading of the first reform bill was carried in the Commons by a majority of one. This was equivalent to a defeat, and further failures precipitated a dissolution. The confidence which the bold action of the ministry had won was soon plainly proved, for the second reading was carried in the new parliament by a majority of 136. When the bill had at length passed the Commons after months of debate, it was Grey's task to introduce it to the Lords. It was rejected by a majority of forty-one. The safety of the country now depended on the prudence and courage of the ministry. The resignation of Grey and his colleagues was dreaded even by the opposition, and they remained in office with the intention of introducing a third reform bill in the next session. The last months of 1831 were the beginning of a political crisis such as England had not seen since 1688. The two extreme parties, the Ultra-Radicals and the Ultra-Tories, were ready for civil war. Between them stood the ministry and the majority of intelligent peace-loving Englishmen; and their course of action was soon decided. The bill must be passed, and there were but two ways of passing it.

One was to declare the consent of the House of Lords unnecessary to the measure, the other to create, if necessary, new peers in sufficient number to outvote the opposition. These two expedients did not in reality differ. To swamp the house in the way proposed would have been to destroy it. The question whether the ministry should demand the king's consent to such a creation, if necessary, was debated in the cabinet in September. Brougham proposed it, and gradually a majority of the cabinet were won over. Grey had at first refused to employ even the threat of so unconstitutional a device as a means to the proposed end. But his continued refusal would have broken up the ministry, and the breaking up of the ministry must now have been the signal for revolution. The second reading in the Commons was passed in December by a majority of 162, and on New Year's Day, 1832, the majority of the cabinet resolved on demanding power to carry it in the lords by a creation of peers. It was not until April 9th that Grey moved the second reading in the Lords. A sufficient number of the opposition temporized; and the second reading was allowed to pass by a majority of nine. Their intention was to mutilate the bill in committee. The Ultra-Tories, headed by the duke of Wellington, had entered a protest against the second reading, but they were now politically powerless. The struggle had become a struggle on the one hand for the whole bill, to be carried by a creation of peers; and on the other for some mutilated measure. The king, a weak and inexperienced politician, had in the meantime been wrought upon by the temporizing leaders in the Lords. He was induced to believe that if the Commons should reject the mutilated bill when it was returned to them, and the ministry should consequently retire, the mutilated bill might be reintroduced and passed by a Tory ministry. He was deaf to all representations of the state of public opinion; and to the surprise of the ministry, and the terror and indignation of every man of sense in the country, he rejected their proposal, and accepted their resignation, May 9, 1832. The duke of Wellington undertook the hopeless task of constructing a ministry which should pass a restricted or sham reform bill, and after a week of the profoundest agitation throughout the country, the king, beaten and mortified, was forced to send for Grey and Brougham. On being told that his consent to the creation of peers was the only condition on which they could undertake the government, he angrily and reluctantly yielded. The chancellor, with cool forethought, demanded this consent in writing. Grey thought such a demand harsh and unnecessary. "I wonder," he said to Brougham, when the interview was over, "you could have had the heart to press it." But Brougham was inexorable, and the king signed the following paper: "The king grants permission to Earl Grey, and to his chancellor, Lord Brougham, to create such a number of peers as will be sufficient to ensure the passing of the Reform Bill, first calling up peers' eldest sons.—WILLIAM R., Windsor, May 17, 1832." This brief paper may be called the Magna Charta of responsible government. It established the right of a ministry to break down, by some convenient means, a factious opposition in the Lords; and this right has never since been practically disputed.

It is well known that in after years both Grey and Brougham disclaimed any intention of executing their threat. Grey took but little part in directing the legislation of the reformed parliament. Lord Althorp resigned, and Grey, who had lately passed his seventieth year, took the opportunity of resigning also. Grey was succeeded by Lord Melbourne; but no other change was made in the cabinet. Grey took no further part in politics. During most of his remaining years he con-

tinued to live in retirement at Howick, where he died on July 17, 1845, in his eighty-second year.

GREY, LADY JANE, a person remarkable no less for her accomplishments than for her misfortunes, was the great-granddaughter of Henry VII. of England. Her descent from that king was traced through a line of females. His second daughter, Mary, after being left a widow by Louis XII. of France, married Charles Brandon, duke of Suffolk, who was a favorite with her brother King Henry VIII. Of this marriage came two daughters, the elder of whom, Lady Frances Brandon, was married to Henry Grey, marquis of Dorset; and their issue, again, consisted of daughters only. Lady Jane, the subject of this article, was the eldest of three whom the marquis had by Lady Frances. Thus it will appear that even if the crown of England had ever fallen into the female line of descent from Henry VII., she could not have put in a rightful claim unless the issue of his elder daughter, Margaret, had become extinct. But Margaret had married James IV. of Scotland; and, though her descendant, James VI., was ultimately called to the English throne, Henry VIII. had placed her family after that of his second sister in the succession; so that, failing the lawful issue of Henry himself, Lady Jane would, according to this arrangement, have succeeded. It was to these circumstances that she owed her exceptional position in history, and became the victim of an ambition which was not her own.

She was born in Leicestershire, about the year 1537. Her parents bestowed more than ordinary care upon her education, and she herself was so teachable, and delighted so much in study, that she became the marvel of the age for her acquirements. She not only excelled in needlework and in music, both vocal and instrumental, but while still very young she had thoroughly mastered Latin, Greek, French and Italian. She had also acquired some knowledge of at least three Oriental tongues, Hebrew, Chaldee and Arabic. After the fashion of those days she was, when about ten years old, placed for a time in the household of Thomas, Lord Seymour, who induced her parents to let her stay with him by promising to marry her to his nephew, King Edward VII. Lord Seymour, however, was attainted of high treason, and beheaded in 1549, and his brother, the duke of Somerset, made some overtures to the marquis of Dorset to marry her to his son, the earl of Hertford. These projects, however, came to nothing. The duke of Somerset in his turn fell a victim to the ambition of Dudley, duke of Northumberland, and was beheaded three years after his brother. Meanwhile, the dukedom of Suffolk having become extinct by the deaths of Charles Brandon and his two sons, the title was conferred upon the marquis of Dorset, Lady Jane's father. Northumberland, who was now all-powerful, fearing a great reverse of fortune in case of the king's death, whose health soon began visibly to decline, endeavored to strengthen himself by marriages between his family and those of other powerful noblemen, especially of the new-made duke of Suffolk. His three eldest sons being already married, the fourth, who was named Lord Guildford Dudley, was accordingly wedded to Lady Jane Grey about the end of May, 1553. The match received the full approval of the king, who furnished the wedding apparel of the parties by royal warrant. But Edward's state of health warned Northumberland that he must lose no time in putting the rest of his project into execution. He persuaded the king that if the crown should descend to his sister Mary, the work of the Reformation would be undone and the liberties of the kingdom would be in danger. Besides, both Mary and her sister Elizabeth had been declared illegitimate

by separate acts of parliament, and the objections to Mary Queen of Scots did not require to be pointed out. Edward was easily persuaded to break through his father's will and make a new settlement of the crown by deed. The document was witnessed by the signatures of all the council, and of all but one of the judges; but those of the latter body were not obtained without difficulty by threats and intimidation.

Edward VI. died on July 6, 1553, and it was announced to Lady Jane that she was queen. She was then but sixteen years of age. The news came upon her as a most unwelcome surprise, and for some days she resisted all persuasions to accept the fatal dignity; but at length she yielded to the entreaties of her father, her father-in-law, and her husband. The better to mature their plans the cabal had kept the king's death secret for some days, but they proclaimed Queen Jane in London on the 10th. The people received the announcement with manifest coldness, and a vintner's boy was even so bold as to raise a cry for Queen Mary, for which he next day had his ears nailed to the pillory and afterward cut off. Mary, however, had received early intimation of her brother's death, and, retiring from Hunsdon into Norfolk, gathered around her the nobility and commons of those parts. Northumberland was dispatched thither with an army to oppose her; but after reaching Newmarket he complained that the council had not sent him forces in sufficient numbers, and his followers began to desert. News also came that the Earl of Oxford had declared for Queen Mary; and as most of the council themselves were only seeking an opportunity to wash their hands of rebellion, they procured a meeting at Baynard's Castle, revoked their former acts as done under coercion, and caused the lord mayor to proclaim Queen Mary, which he did amid the shouts of the citizens. The Duke of Suffolk was obliged to tell his daughter that she must lay aside her royal dignity and become a private person once more. She replied that she relinquished most willingly a crown that she had only accepted out of obedience to him and her mother; and her ten days' reign was over.

The leading actors in the conspiracy were now called to answer for their deeds. Northumberland was brought up to London a prisoner, tried and sent to the block, along with some of his partisans. The Duke of Suffolk and Lady Jane were also committed to the Tower; but the former, by the influence of his duchess, procured a pardon. Lady Jane and her husband, Lord Guildford Dudley, were also tried, and received sentence of death for treason. This, however, was not immediately carried out; on the contrary the queen seems to have wished to spare their lives, and mitigated the rigor of their confinement. Unfortunately, owing to the general dislike of the queen's marriage with Philip of Spain, Sir Thomas Wyatt soon after raised a rebellion in which the Duke of Suffolk and his brothers took part, and on its suppression the queen was persuaded that it was unsafe to spare the lives of Lady Jane and her husband any longer. On hearing that they were to die, Lady Jane declined a parting interview with her husband lest it should increase their pain, and prepared to meet her fate with Christian fortitude. She and her husband were executed on the same day, February 12, 1554, her husband on Tower Hill, and herself within the Tower an hour afterward, amidst universal sympathy and compassion.

GREYHOUND. See DOG.

GREYTOWN, or more correctly San Juan del Norte, a small town of Nicaragua, worthy of note as the only port of the republic on the coast of the Atlantic and as the eastern terminus proposed for the Nicaraguan inter-oceanic canal. The town lies along the seaward side of a

narrow peninsula formed by the windings of the San Juan river, and most of its buildings are insignificant erections raised two or three feet on piles. Though it is still a port of call for mail steamers, and monopolizes the export and import trade of Nicaragua, Greytown is in a decadent condition. Its fine harbor has become almost useless. The harbor of San Juan, first discovered by Columbus, was brought into further notice by Capt. Diego Machuca, who in 1529 sailed down the river from the Lake of Nicaragua. The date of the first Spanish settlement on the spot is not known, but in the seventeenth century there were fortifications at the mouth of the river. In 1796 San Juan was made a port of entry by royal charter, and new defenses were erected in 1821. The patriots of Nicaragua seized the place at the revolution, but they were expelled in January, 1848, by the British, who, claiming the district in the name of the "king of the Mosquito Indians," continued in possession till the treaty of 1860. In 1854 the town was bombarded by the United States forces for an alleged insult.

GRIBOYEDOFF, ALEXANDER SERGUEEVICH, was born in 1795 at Moscow, where he studied at the university from 1810 to 1812. He then obtained a commission in a hussar regiment, but resigned it in 1816. Next year he entered the civil service, and in 1818 was appointed secretary of the Russian legation in Persia, whence he was transferred to Georgia. There he began the drama which has made him famous. He had commenced writing early, and had produced on the stage at St. Petersburg in 1819 a comedy in verse, translated from the French, called *The Young Spouses*, which was followed by some other pieces of the same kind. But neither these, nor the essays and verses, which he wrote for periodicals, would have been long remembered but for the immense success gained by his comedy in verse, *Goré et uma*, or "Misfortune from Intelligence." Griboyedoff spent the summer of 1823 in Russia, completed his play, and took it to St. Petersburg. There it was rejected by the censorship. Many copies were made and privately circulated, but Griboyedoff never saw it published. The first edition was printed in 1833, four years after his death. He was sent to Persia as a minister-plenipotentiary. Soon after his arrival at Teheran a tumult arose, caused by the anger of the populace against some Georgian and Armenian captives, — Russian subjects, — who had taken refuge in the Russian embassy. It was stormed, Griboyedoff was killed (February 11, 1829), and his body was for three days so ill-treated by the mob that it was at last recognized only by an old scar on the hand, due to a wound received in a duel. It was taken to Tiflis, and buried in the monastery of St. David.

GRIESBACH, JOHANN JAKOB, one of the most distinguished of the band of scholars to whom the modern science of New Testament textual criticism owes its origin, was born at Butzbach, a small town of Hesse-Darmstadt, where his father was pastor, January 4, 1745. At the close of his undergraduate career, he undertook a literary tour which, apart from the advantages of stimulative contact with many of the most distinguished scholars of England, France and Holland, as well as of his own country, was of great utility to him in providing him with materials for the great work of his subsequent life. On his return to Halle, he acted for some time as "privat-docent," but in 1773 was appointed to a professorial chair; in 1775 he was translated to Jena, where the remainder of his life was spent in ever-increasing usefulness and honor, and where he died March 24, 1812.

GRIFFIN, or GRYPHON, in the natural history of the ancients, the name of an imaginary rapacious creature

ure of the eagle species, represented with four legs, wings and a beak—the fore part resembling an eagle, and the hinder a lion. In addition, some writers describe the tail as a serpent. This animal, which was supposed to watch over gold mines and hidden treasures and to be the enemy of the horse, was consecrated to the sun; and the ancient painters represented the chariot of the sun as drawn by griffins. According to Spanheim, those of Jupiter and Nemesis were similarly provided.

GRIFFIN, GERALD, an Irish novelist and dramatic writer, was descended from a family of good position and was born at Limerick, December 12, 1803. In London he obtained occupation as a parliamentary reporter, and gradually the *Literary Gazette*, the *News of Literature*, and other periodicals of standing began to look upon his contributions with favor. Some of his dramatic pieces were accepted also by one of the theaters; and the publication in 1827 of a series of tales under the title of *Holland Tide* was so successful that he at once set about the preparation of a similar series which appeared the same year in two volumes under the title of *Tales of the Munster Festivals*, and were still more popular. In 1828 appeared the *Collegians*, afterward so successfully adapted for the stage under the title of the *Colleen Bawn*. It is said to have been the favorite novel of O'Connell; and besides exhibiting that masterly delineation of both the pathetic and the humorous features of Irish character already shown in his other works, it was written with a verve and a dramatic intensity and realism far surpassing all his previous or subsequent efforts. His principal other works are *The Invasion*, *The Rivals*, *Tracy's Ambition*, and *The Tales of Five Senses*. He was admitted into a Dublin monastery in September, 1838 under the name of Brother Joseph, and in the following summer he removed to Cork, where he died of typhus fever June 12, 1840.

GRILLPARZER, FRANZ, a distinguished German dramatist, was born in Vienna on January 15, 1791. In 1847 he was made a member of the Academy of Sciences. From early youth he displayed a strong literary impulse. He devoted especial attention to the Spanish drama, and nearly all his writings bear marks of the influence of Calderon. When he began to write, the German stage was dominated by the wild plays of Werner, Müllner and other authors of the so-called "fate-tragedies." His first play, *Die Ahnfrau* (The Ancestress), published in 1816, was penetrated by their spirit. Another and more ambitious work in the classic style was *Das goldene Vlies* (The Golden Fleece), a trilogy published in 1822. Of its three parts the greatest is *Medea*, which some critics consider his highest achievement. In *Waves of the Sea and of Love*, which appeared in 1840, Grillparzer again formed his work on classic models. The subject is the story of *Hero and Leander*, and it has never been more happily treated than in some passages, which, however, are marked rather by lyrical than dramatic qualities.

In 1825 Grillparzer published *King Ottocar's Fortune and End*. It appealed strongly to the patriotic sympathies of Vienna, dealing as it does with one of the proudest periods of Austrian history—the time of Rudolf I., the founder of the house of Hapsburg.

After 1840, when his solitary comedy was rejected by the public, he almost passed from the memory of his contemporaries. Fortunately for him, Heinrich Laube, an admirer of his genius, settled in Vienna in 1849 as artistic director of the court theater. By and by Laube reintroduced on the stage some of the forgotten works, and their success was immediate and profound. To his own surprise, Grillparzer became the most popular author of the day; he was ranked with Goethe and

Schiller, and lauded as the national poet of Austria. On the eightieth anniversary of his birthday all classes from the court downward united to do him honor; never, probably, did Vienna exert herself so much to prove her respect for a private citizen. He died on January 21, 1872, and was buried with an amount of ceremony that surpassed even the pomp displayed at Klopstock's funeral. A monument of him has recently been erected at Baden, near Vienna.

GRIMALDI, GIOVANNI FRANCESCO, an architect and painter, named Il Bolognese from the place of his birth, was a relative of the Caracci family, under whom it is presumed he studied first, and afterward under Albano. He went to Rome, and was appointed architect to Pope Paul V., and patronized by succeeding popes also. Toward 1648 he was invited to France by Cardinal Mazarin, and for about two years was employed in buildings for that minister and for Louis XIV., and in fresco-painting in the Louvre. Returning to Rome, he was made president of the Academy of St. Luke; and in that city he died on November 28, 1680, in high repute not only for his artistic skill but for his upright and charitable deeds as well.

GRIMM, FRIEDRICH MELCHIOR, BARON VON, the author of the celebrated *Correspondance littéraire*, was, though a naturalized Frenchman, both of German descent and a native of Germany, having been born of poor parents at Ratisbon, December 26, 1723. He studied at the university of Leipsic, where he had as professor the celebrated Ernesti, to whom he was doubtless in no small degree indebted for his critical appreciation of classical literature. On completing his studies he made his literary début by a tragedy which was received with ridicule by the audience and by the critics, including Lessing, and which is now forgotten even in Germany. In 1749 he made the acquaintance of J. J. Rousseau, which, through a mutual sympathy in regard to musical matters, soon ripened into intimate friendship. Through Rousseau he was introduced to the Encyclopedists, and about the same time he became secretary to Count Friesen, nephew of Marshal Saxe, which gained him admission to the most brilliant society of Paris. He rapidly obtained a thorough knowledge of the French language, and acquired so perfectly the tone and sentiments of the society in which he moved that all marks of his foreign origin and training seemed completely effaced. In 1753 Grimm was engaged by the Abbé Raynal to aid him in conducting his literary correspondence with German sovereigns; and this opened up to him that sphere for his ambition which perhaps was most in accordance with his peculiar tastes, and in which his abilities best fitted him to excel. Although from the beginning he had the principal share in the work, it was probably conducted until 1759 in the name of the Abbé Raynal. With the aid of friends during his temporary absences from France, he carried it on until 1790, and it latterly extended to six sovereigns, including the empress of Russia, the king of Sweden, and the king of Poland. It was probably in 1754 that Grimm was introduced by Rousseau to Madame d'Épinay, his relations with whom led to an irreconcilable rupture between him and Rousseau. The exact amount of Grimm's blameworthiness it is impossible to determine, and the whole matter would be of little consequence but for the fact that Rousseau allowed his resentment to gain such a complete possession of his mind as to induce him to give in his *Confessions* a wholly mendacious portrait of Grimm's character, by which his reputation was for a considerable time injuriously affected. After the death of Count Friesen Grimm obtained the patronage of the duke of Orleans, through whom he was appointed

secretary to Marshal d'Estrées during the campaign of Westphalia in 1756-57. Subsequently he was named minister of Saxe-Gotha at the court of France, but he was deprived of that office on account of having criticised rather caustically certain French ministers in a dispatch that was intercepted by Louis XV. His introduction to Catherine II. of Russia took place in 1773, when he accompanied the suite of the landgrave of Hesse-Darmstadt to St. Petersburg on occasion of the marriage of a daughter of that prince to the only son of Catherine. After the Revolution Grimm retired to Gotha, and in 1792 he emigrated to Russia, where he enjoyed high favor at the court of Catherine, and had assigned him the nominal and agreeable duty of entertaining her for so many hours a day by his conversation. This state of things came, however, to an end in 1795, when, notwithstanding his supplications to be retained at court if only as one of her majesty's dogs, he was appointed minister of Russia at Hamburg. He died at Gotha, December 19, 1807.

GRIMM, JACOB LUDWIG CARL (1785-1863), was born January 4, 1785, at Hanau, in Hesse-Cassel. His father, who was a lawyer, died while he was still a child, and the mother was left with very small means; but her sister, who was lady of the chamber to the landgrave of Hesse, helped to support and educate her numerous family. Jacob with his younger brother Wilhelm (born on February 24, 1786) was sent in 1798 to the public school at Cassel. In 1802 he proceeded to the university of Marburg, where he applied himself to the study of law. His brother joined him at Marburg a year later, and likewise began the study of law. Up to this time Grimm had been actuated only by a general thirst for knowledge and the instinct of intellectual activity, and his energies had not found any aim beyond the practical one of making himself a position in life. The first definite impulse came from the lectures of Savigny, the celebrated investigator of Roman law, who, as Grimm himself says (in the preface to the *Deutsche Grammatik*), first taught him to realize what it meant to study any science, whether that of law or any other. Savigny's lectures at the same time awakened in him that love for historical and antiquarian investigation which forms the basis of all his work. Then followed personal acquaintance, and it was in Savigny's well provided library that Grimm first turned over the leaves of Bodmer's edition of the Old German minnesingers and other early texts, and felt an eager desire to penetrate further into the obscurities and half-revealed mysteries of their language. In the beginning of 1805 he received an invitation from Savigny, who had removed to Paris to continue his researches among the libraries there, to join him and help him in his literary work. This offer was accepted by young Grimm, who passed a very happy time in Paris, enjoying the society of Savigny, and strengthening his taste for the literatures of the Middle Ages by his studies in the Paris libraries. Toward the close of the year he returned to Cassel, where his mother and Wilhelm had settled, the latter having finished his studies. The next year he obtained a situation in the war office with the very small salary of 100 thalers. One of his grievances was, as he himself tells us in his autobiography, that he had to exchange his stylish Paris suit for a stiff uniform and pigtail. But he had full leisure for the prosecution of his studies. In 1808, soon after the death of his mother, he was appointed superintendent of the private library of Jerome Bonaparte, king of Westphalia, into which Hesse-Cassel had been incorporated by Napoleon. He was treated with marked favor by the king, who appointed him an auditor to the state council, while he still retained his other post.

His salary was increased in a short interval from 2,000 to 4,000 francs, which removed all anxiety as to the means of subsistence, and his official duties were hardly more than nominal. After the expulsion of Jerome and the reinstallation of an elector, Grimm was appointed in 1813 secretary of legation to accompany the Hessian minister to the headquarters of the allied army. In 1814 he was sent to Paris to demand restitution of the books carried off by the French, and in 1814-15 he attended the congress of Vienna as secretary of legation. On his return he was again sent to Paris on the same errand as before. Meanwhile Wilhelm had received an appointment in the Cassel library, and in 1816 Jacob was made second librarian under Völkel. On the death of Völkel in 1828 the brothers expected to be advanced to the first and second librarianships respectively, and were much dissatisfied when the first place was given to Rommel, keeper of the archives. So they removed next year to Göttingen, where Jacob received the appointment of professor and librarian, Wilhelm that of under-librarian. Jacob Grimm lectured on legal antiquities, historical grammar, literary history, and diplomatics, explained Old German poems, and commented on the *Germania* of Tacitus. In 1837, being one of the seven professors who signed a protest against the king of Hanover's abrogation of the constitution which had been established some years before, he was dismissed from his professorship, and banished from the kingdom of Hanover. He returned to his native Cassel together with his brother, who had also signed the protest, and remained there till, in 1840, they accepted an invitation from the king of Prussia to remove to Berlin, where they both received professorships, and were elected members of the Academy of Sciences. Not being under any obligation to lecture, Jacob very seldom did so, but together with his brother worked at the great dictionary, the plan of which had already been partly developed. During their stay at Cassel Jacob regularly attended the meetings of the academy, where he read papers on the most varied subjects. The best known of these are those on Lachmann, Schiller, and his brother Wilhelm (who died in 1859), on old age, and on the origin of language. He also described his impressions of Italian and Scandinavian travel, interspersing his more general observations with linguistic details, as is the case in all his works. He died in 1863, working up to the last.

GRIMM, WILHELM CARL (1786-1859). The chief events in the life of Wilhelm Grimm have been narrated in last article. The two brothers were indeed so intimately associated both in their lives and in their works that a separate biography of the younger is almost superfluous. As Jacob himself said in his celebrated address to the Berlin Academy on the death of his brother, the whole of their lives were spent together. In their schooldays they had one bed and one table in common, as students they had two beds and two tables in the same room, and they always lived under one roof, and had their books and property in common. Nor did Wilhelm's marriage in any way disturb their harmony. Wilhelm's character was a complete contrast to that of his brother. As a boy he was strong and healthy, but as he grew up he was attacked by a long and severe illness, which left him weak all his life. His was a less comprehensive and energetic mind than that of his brother, and he had less of the spirit of investigation in him, preferring to confine himself to some limited and definitely bounded field of work; he utilized everything that bore directly on his own studies, and ignored the rest.

GRIMMA, a town in the circle of Leipsic, Saxony, is situated on the left bank of the Mulde, nineteen miles southeast of Leipsic. Population about 7,500.

GRIMSBY, GREAT, a municipal and parliamentary borough and seaport town of England, county of Lincoln, is situated on the south side of the estuary of the Humber nearly opposite Spurn Head, and seventeen miles east-southeast of Hull. Population (1901), 63,138.

GRINDAL, EDMUND, archbishop of Canterbury, was born at Hensingham in the parish of St. Bees, Cumberland, about 1519. He was educated at Cambridge, where he became fellow of Pembroke Hall in 1538, and president in 1549. In the following year he was appointed chaplain to Bishop Ridley, in August, 1551, precentor of St. Paul's, in November chaplain to Edward VI., and in July, 1552, prebendary of Westminster. On the accession of Mary in 1553 he took refuge on the continent, where he acquired a competent knowledge of German, and occupied himself also in collecting the "writings and stories of the learned and pious sufferers in England"—the result of his inquiries being afterward communicated to John Foxe, and incorporated by him in his *Book of Martyrs*. Returning to England under the new regime in 1558, he assisted in the preparation of the new liturgy, and was also one of the eight Protestant divines chosen to hold public disputes with the popish prelates. In 1559 he was appointed to the mastership of Pembroke Hall, and in the same year he succeeded Bonner as bishop of London. In 1570 Grindal was appointed to the see of York, from which he was translated to Canterbury in February, 1576. Having in the same year incurred the royal displeasure by refusing to suppress the meetings held among the clergy for "the exercise of prophesying," he was ultimately, in June, 1577, by order of the Star Chamber confined to his house and sequestered for six months. As in November he refused to make a formal submission to the queen, his suspension was continued for several years; but though a petition for his restoration, which was drawn up by convocation in 1580, was not immediately granted, it would appear that in 1582 he had resumed, at least partially, the exercise of his ecclesiastical functions. About the end of this year the queen, on account of his blindness, requested him to retire on a pension, but the negotiations connected with his resignation were not completed till April, 1583, and it was only after his death at Croydon, July 6th of the same year, that Whitgift, who had been nominated his successor, entered upon the see.

GRINDSTONE. Sandstones which possess the property of abrading steel and other hard substances are extensively used in arts and manufactures under the name of grindstones. In its simplest form a grindstone consists of a stone disc, more or less circular, mounted on a horizontal iron spindle carried on the tops of two wooden posts fixed in the ground. A winch handle, or occasionally a rude crank with treadle, provides the means of giving a slow rotation to the stone, against the cylindrical face of which the steel or other substance which is to be ground is held. Such grindstones—possessing neither truth of figure nor the means of obtaining it—are unsuitable for any but the roughest purposes; and although by mounting them in a frame to which a rest can be attached it is possible to keep them true and tolerably efficient, they are always slow in their action.

GRINGOIRE, or GRINGON, PIERRE, was the last of the mediæval poets. He lived to see the old methods which he was taught to believe unchangeable entirely superseded.

The place of his birth is uncertain. Perhaps it was Lorraine, perhaps Normandy. His real name was Gringon, which he changed to Gringoire, for the poetical reason that it sounded better. His early history is almost entirely unknown; at the age of nineteen

or twenty he produced his first poem, *Le Château de Labour*, in which he is supposed to have narrated his own experiences. Most probably he did. Finding that the trade in allegorical poems was ruined for want of demand, and discovering an opening in the direction of mysteries, Gringoire began to produce those dramas, and joined the "Enfants de Sans Souci." The fraternity advanced him to the dignity of "Mère Sotte," and afterward to the highest honor of the guild, that of "Prince des Sots."

Among his principal works are *Les Folles Entreprises* and *Les Abus du Monde*,—poems in which everything under the sun is criticised,—certain political pieces, such as *La Chasse du Cerf des Cerfs* and *La Mère Sotte*, with all her literary offspring. During the last twenty years of a long life he became orthodox and contributed the *Blason des Héretiques* to orthodox literature. It was during this period also that he wrote the work by which he is best known, the *Mystère de la Vie de Saint Louis*, of which an analysis may be found in M. Leroy's *Études sur les Mystères*. After more than three hundred years of oblivion this poet has been republished, not so much on account of his own merits as because of the position which he occupies in the history of dramatic literature.

GRIQUALAND WEST, a province in South Africa, comprising the territory formerly belonging to the western division of the Griqua people; which was annexed to the British empire October 27, 1871. The extent of the province is 15,107 square miles. It is bounded on the south by the Orange River (which separates it from the Cape Colony), on the north and north-east by territory occupied by the Bechuana tribes and the Transvaal settlement, and on the east by the Orange Free State. A portion of the territory is adapted for sheep-farming, and the river basins contain fertile lands suitable for agricultural purposes. But the great wealth of the country is in its diamond mines. Since the first discovery of diamonds, in 1867, the total value of the gems exported from the province is estimated at \$20,000,000. Digging operations were at first confined to the alluvial deposits on the banks of the Vaal River, but in 1871 mines were opened in the locality known as the "dry diggings," which have since received the names of Kimberley, De Beer's, Du Toit's Pan, and Bultfontein, all situated within a radius of a few miles. The area of the diamond-producing ground at each of these places is distinctly defined. At Kimberley the mine covers only nine acres, at De Beer's fourteen acres, at Du Toit's Pan forty-one acres, and at Bultfontein twenty-two acres. Kimberley, the chief center of the mining industry, is the capital of the province and the seat of government. There is a resident lieutenant-governor or administrator, who is assisted by an executive council, and a legislative council composed of members partly elective and partly nominated by the crown. There is also a high court of justice presided over by a resident recorder. The other towns are Du Toit's Pan (including Bultfontein), Barkly, and Griqua Town. The villages and native locations are Hebron, Likatlong, Boetsap, Campbell, and Douglas. Among the river diggings or encampments are Pniel, Waldek's Plant, Sifonell, and Setlacomie's. A census taken in 1891 showed the total population of Griqualand West at that time to be 83,375, of whom 29,670 were Europeans.

GRISONS (German, *Graubünden*) is the largest and easternmost of the Swiss cantons. It is eighty miles in length from east-northeast to west-southwest, and forty-five in breadth, and has an area of 2,773 square miles. On the northeast and east it abuts against the little principality of Liechtenstein, and the Austrian

provinces of Tyrol and Vorarlberg, on the south on the Italian provinces of Val Tellina and Como, and on the west and north on the Swiss cantons of Ticino, Uri, Glarus, and St. Gall. Pop. (1901), 104,520.

The whole canton is mountainous, and, with the exception of the Rhine valley below Reichenau and the Italian valleys, which still form part of it, has a severe alpine climate and vegetation. One-tenth of the surface is covered by glaciers.

Since Roman times the passes of the Grisons have been among the most frequent routes across the Alps. The Julier and Bernina, the Septimer, Splügen, and Lukmanier, were the most used in the Middle Ages.

GRIVEGNÉE, a town of Belgium in the arrondissement and province of Liège, is situated on the Ourthe about a mile and a half southwest of Liège. Population about 7,000.

GROCYN, WILLIAM, an English scholar of the fifteenth century, was born at Bristol about 1442. Designed by his parents for the church, he was sent to Winchester College, and there he remained till his twenty-second year, when he was elected to a scholarship at New College, Oxford. Having been chosen reader in divinity in Magdalen College in 1483, it fell to his lot to maintain a disputation with John Taylor, professor of divinity, in presence of King Richard III., and so well did he carry himself in the matter that the king sent him a buck and five marks. As lecturer in Exeter College he found an opportunity of indoctrinating his countrymen in the new learning, and had the honor of teaching Greek not only to Sir Thomas More but to Erasmus himself, who was indebted to him also for an introduction to Archbishop Warham. When, some time afterward, Grocyn removed to London, he was chosen by Dean Colet to deliver lectures in St. Paul's. He died in 1519.

GRODNO, a western province or government of Russia in Europe, bounded north by Vilna, east by Minsk, south by Volhynia, and west by the former kingdom of Poland; area, 14,931 square miles. In 1897 the population was 1,617,859, comprising Lithuanians, Russians, Poles, Tartars, and a few German colonists.

GRODNO, capital of the province of the same name, stands on the right bank of the Niemen, and is connected by railway with St. Petersburg, Moscow, and Warsaw. Pop. (1897), 46,871.

GROEN VAN PRINSFERER, WILHELM, Dutch statesman, historian, and publicist, was born at Voorburg, on August 21, 1801, received his grammar school education at the Hague, and studied law, philosophy, and history at the university of Leyden. At the age of twenty-five he published a volume of miscellaneous essays (*Verspreide Geschriften*, 1826), and in 1827 he was appointed private secretary to King William I. From this post he retired in 1833, in order that he might devote himself with less interruption to historical researches. He entered the chamber of representatives in 1840, and took part with both tongue and pen in all the more important discussions of the years that followed, especially in those of 1848 and 1849. Between 1849 and 1865 he frequently sat in the second chamber, and from 1850 to 1855 the anti-liberal newspaper *Nederlander* was managed by him. The mortification which European events in 1864 and in 1866 had caused him, found expression in the occasional writings entitled *La Prusse et les Pays-Bas*, *A mes amis à Berlin*, and *L'Empire Prussien et L'Apocalypse* (1867). Shortly afterward he withdrew entirely from public affairs, but continued his literary pursuits, his latest production *Maurice et Barnelut*, an able vindication of the Calvinistic prince as against the Armenian statesman, hav-

ing been completed (1875) only a short time before his death, which occurred May 19, 1876.

GRONINGEN, a town of the Netherlands, in the province of the same name, is situated on the Hunse at the influx of the Aa, forty-five and a-half miles in an eastward direction from Harlingen. Population (1901) of province, 302,681; of town, 67,563.

GRONOVIVS, or GRONOV, JAKOB, one of the very great scholars of the seventeenth century, was born October 20, 1645, at Deventer, where his father, J. F. Gronovius, was at that time professor of rhetoric and history. On the completion of his studies at Leyden, where he had early distinguished himself by his powers of intellectual acquisition, he in 1668 visited England, where he became acquainted with Pocock, Pearson, and Mery Casaubon, and where he devoted several months to the collation of rare manuscripts at Oxford and Cambridge. His edition of Polybius, published at Leyden in 1670, in addition to his own and variorum notes, contained those which Casaubon on his deathbed had bequeathed to him. Declining an invitation to a chair at Deventer, he in 1671 visited France, and was brought into intimate relations with D'Herbelot, Thevenot, and other distinguished scholars; and after another brief interval at Leyden he in 1672 traveled in Spain, whence he passed into Italy. There he accepted from the grand duke of Tuscany a chair at the university of Pisa, which, however, he resigned at the end of two years. Having returned to Deventer by way of Germany, he had settled down with the purpose of working uninterruptedly at an edition of Livy, when in 1679 he was invited by the curators of the university of Leyden to occupy a professorial chair. He died October 21, 1716.

GRONOVIVS, or GRONOV, JOHANN FRIEDRICH, scholar and critic, was born at Hamburg, September 20, 1613. He went through his early studies with great distinction at Bremen, and afterward attended the universities of Leipsic, Jena, and Altorf, whence he extended his travels into France and Italy. In 1643 he was appointed professor of rhetoric and history at Deventer, and in 1658 he succeeded Daniel Heinsius in the Greek chair at Leyden, where he died on December 28, 1671.

GROOT, GERHARD, founder of the society of "Brethren of the Common Life," was born in October 1340, at Deventer, where his father held a good civic position. Other forms of the family name are Groote, Groet and Groete. At the close of his school education, received partly at Deventer and partly at Aix-la-Chapelle and Cologne, Gerhard ("Gerrit or Geert") in his fifteenth year entered the university of Paris, where he made distinguished progress in almost all the branches of learning then cultivated—canon law, medicine, astrology and even magic being added to the theology and philosophy of the schoolmen. We next hear of him as learning and teaching in Cologne; according to one account he studied also at Prague; and in 1360 he visited, on public business it is presumed, the papal court at Avignon. About this time he was appointed to a couple of canopies at Utrecht and Aix-la-Chapelle respectively, and the life of the brilliant young scholar was rapidly becoming luxurious, secular, and selfish, when a great spiritual change passed over him which resulted in a final renunciation of every worldly enjoyment. Between 1374 and 1379 Gerhard had also spent some three years in all at Munnikhhuizen in study and prayer; and in the course of the last-mentioned year he left the privacy of the cloister, and having received ordination as a deacon, became a missionary preacher within the diocese of Utrecht. The success which followed his labors, not only in the town

of Utrecht itself, but also in Zwolle, Kampen, Leyden, Delft, Gouda, Amsterdam, and many other places, was immense; according to Thomas à Kempis, the people left their business and their meals to hear his sermons, so that the churches could not hold the crowds that flocked wherever he came. By a skillfully framed episcopal edict of 1383, which excluded from the pulpit all who had not received priest's orders, his public preaching was brought abruptly to an end; an appeal to Urban VI. was made in vain. After a comparatively brief life of singular energy, patience, and self-denial, Groot fell a victim to the plague at Deventer on August 20, 1384.

GROS, ANTOINE JEAN, BARON, the pupil of David and the forerunner of Géricault, occupies a peculiar position between the classic and romantic schools which divided opinion at the beginning of the present century. He was born at Paris in 1771. Toward the close of 1785 Gros, by his own choice, entered the studio of David, which he frequented assiduously, continuing at the same time to follow the classes of the Collège Mazarin. The death of his father, whose circumstances had been embarrassed by the Revolution, threw Gros, in 1791, upon his own resources. He now devoted himself wholly to his profession, and competed in 1792 for the *grand prix*, but unsuccessfully. About this time he was, however, on the recommendation of the École des Beaux Arts, employed on the execution of portraits of the members of the Convention, and when—disturbed by the development of the Revolution—Gros in 1793 left France for Italy, he supported himself at Genoa by the same means, producing a great quantity of miniatures and *fixés*. He visited Florence, but returning to Genoa made the acquaintance of Josephine, and followed her to Milan where he was well received by her husband. On November 15, 1796, Gros was present with the army near Arcola when Bonaparte planted the tricolor on the bridge. Gros seized on this incident, and showed by his treatment of it that he had found his vocation. Bonaparte at once gave him the post of "inspecteur aux revues," which enabled him to follow the army, and in 1797 nominated him on the commission charged to select the spoils which should enrich the Louvre. In 1799, having escaped from the besieged city of Genoa, Gros made his way to Paris, and in the beginning of 1801 took up his quarters in the Capucins. *Les Pestiférés de Jaffa* (Louvre), was followed by the *Battle of Aboukir*, 1806 (Versailles), and the *Battle of Eylau*, 1808 (Louvre). These three subjects—the popular leader facing the pestilence unmoved, challenging the splendid instant of victory, heart-sick with the bitter cost of a hard-won field—gave to Gros his chief titles to fame. In 1810 his *Madrid and Napoleon at the Pyramids* (Versailles), show that his star had deserted him. His *Francis I. and Charles V.*, 1812 (Louvre), had considerable success; but the decoration of the dome of St. Geneviève (begun in 1811 and completed in 1824) is the only work of Gros' later years which shows his early force and vigor, as well as his skill. The *Departure of Louis XVIII.* (Versailles), the *Embarkation of Madame d'Angoulême* (Bordeaux), the plafond of the Egyptian room in the Louvre, and finally his *Hercules and Diomedes*, exhibited in 1835, testify only that Gros' efforts—in accordance with the frequent councils of his old master David—to stem the rising tide of Romanticism served but to damage his once brilliant reputation. Exasperated by criticism and the consciousness of failure, Gros sought refuge in the grosser pleasures of life, but suddenly his vital forces failed him, and on June 25, 1835, he was found drowned on the shores of the Seine near St. Yves.

GROSBEAK, a name very indefinitely applied to many birds belonging to the families *Fringillidae* and *Plocidae* of modern ornithologists, and perhaps to some members of the *Emberizidae* and *Tanagridae*, but always to birds distinguished by the great size of their bill. Taken alone it is commonly a synonym of HAWFINCH, but a prefix is most usually added to indicate the species, as Pine-Grosbeak, Cardinal-Grosbeak, and the like.

The PINE-GROSBEAK is, with the exception of the Hawfinch just mentioned, the best known species to which the name is applied. It inhabits the conifer-zone of both the Old and the New Worlds, seeking, in Europe and probably elsewhere, a lower latitude as winter approaches—often journeying in large flocks.

The VIRGINIAN GROSBEAK, or Virginian Nightingale of many writers, *Cardinalis virginianus*, next claims notice here, though doubts may be entertained as to the family to which it really belongs. No less remarkable for its bright carmine attire, and the additional embellishment of an elongated crest of the same color, than for its fine song, it has been an object of attraction almost ever since the settlement of its native country by Europeans. All American ornithologists speak of its easy capture and its ready adaptation to confinement, which for nearly three centuries have helped to make it a popular cage-bird on both sides of the Atlantic. The vocal powers possessed by the cock are to some extent shared by the hen, though she is denied the vivid hues of her partner, and her plumage, with exception of the wings and tail, which are of a dull red, is light olive above and brownish-yellow beneath. This species inhabits the eastern parts of the United States southward of 40° N. latitude, and also occurs in the Bermudas. It is represented in the southwest of North America by other forms that by some writers are deemed species, and in the northern parts of South America by the *C. phaniceus*, which would really seem entitled to distinction. Another kindred bird, placed from its short and broad bill in a different genus, and known as the Texan Cardinal, is found on the southern borders of the United States and in Mexico; while among North American "Grosbeaks" must also be named the birds belonging to the genera *Guiraca* and *Hedymeles*—the former especially exemplified by the beautiful blue *G. carulea*, and the latter by the brilliant rose-breasted *H. ludovicianus*, which last extends its range into Canada.

GROSE, FRANCIS, a celebrated English antiquary, son of a wealthy Swiss jeweler, settled in England, was born at Greenford, in Middlesex, about the year 1730. The bias of his mind toward heraldry and antiquities showed itself early, and his father, indulging it, procured him a position in the Herald's College. In 1757 he was elected fellow of the Society of Antiquaries. In 1773 he began to publish his *Antiquities of England and Wales*, a work which brought him money as well as fame. This, with its supplementary parts relating to the Channel Islands, was not completed till 1787. In 1789 he set out on an antiquarian tour through Scotland, and in the course of this journey met Burns, who composed in his honor the famous song beginning, "Ken ye aught o' Captain Grose," and in that other poem, still more famous, "Hear, land o' cakes, and brither Scots," warned all Scotchmen of this "chield amang them taking notes." In 1790 he began to publish the results of what Burns called "his peregrinations through Scotland;" but he had not finished the work when he bethought himself of going over to Ireland and doing for that country what he had already done for Great Britain. About a month after his arrival, however, while in Dublin, at the table of his friend Hone,

he was seized with an apoplectic fit, and died in a moment, June 12, 1791.

GROSSENHAIN, a town in the circle of Dresden, Saxony, is situated on the Röder, an affluent of the Elbe, twenty miles northwest of Dresden. Pop. about 17,000.

GROSSETESTE, ROBERT, in some respects the most distinguished of all the English mediæval prelates as regards his personal influence both over the men of his time and on its literature, was born of humble parents at Stradbroke in Suffolk about the year 1175. He was sent by his friends to Oxford, where he studied law and medicine, and seems to have finished his education at Paris, where he probably laid the foundation of his knowledge of Greek and Hebrew. From Paris he returned to Oxford, graduated in divinity, and became master of the schools (*rector scholarum*) or chancellor. He also became the first rector of the Franciscans at Oxford. Here he probably wrote his commentaries on Aristotle, and laid the foundation of his fame as a preacher. His earliest preferment of which we can speak with certainty was the archdeaconry of Wilts, which he held in 1214 and 1220; he was archdeacon of Northampton in 1221, holding at the same time the prebend of Empingham, which belonged to the archdeaconry. This he exchanged for the archdeaconry of Leicester, which he probably held till 1232. In May, 1225, he was collated by Hugh de Wells, bishop of Lincoln, to the church of Abbotsley, Hunts, and at one time he held the rectory of St. Margaret's, Leicester. On the death of Bishop Hugh de Wells in February, 1235, the chapter of Lincoln elected Grosse-teste to the see; the election took place on March 27th; and he was consecrated at Reading on June 17th. His administration of his diocese, then the most extensive in the country, was characterized by great vigor. His energy in his visitations did not pass without opposition; an attempt on his life by poison was made in 1237, from which he recovered with difficulty through the help of John de S. Giles; and in 1239 began the quarrel with the chapter of Lincoln, which lasted six years, and was quieted by the decision of the pope himself. He died in 1253.

GROSSETO, a town of Italy, at the head of the province of the same name, is situated in the Maremma district, near the right bank of the Ombrone-Senese, with a station on the railway between Florence and Rome. Population (1901), 9,600.

GROSSI, TOMMASO, Lombard poet and novelist, was born at Bellano, on the Lake of Como, January 20, 1791. In 1816 he published two poems written in Milanese — *The Golden Rain* and *The Fugitive*. These compositions secured him the friendship of Porta and Manzoni, and the three poets came to form a sort of romantic literary triumvirate.

He next set about writing an epic poem, entitled *The Lombards in the First Crusade*, a work of which Manzoni makes honorable mention in his *Betrothed*. This composition, which was published by subscription (1826), attained a success that has not been equaled by that of any other Italian poem within the century. The example of Manzoni, who had meanwhile published *The Betrothed* (1827), induced his friend Grossi to enter the same arena with an historical novel entitled *Marco Visconti* (1834). A little later Grossi published a tale in verse, *Ulrico and Lida*. After his marriage in 1838 he continued to employ himself as a notary in Milan till his death on December 10, 1853.

GROSSWARDEIN (Hungarian, *Nagy-Várád*, a royal free city, and capital of the county of Bihar, in the Trans-Tibiscan circle, Hungary, is situated in a beautiful plain on the banks of the river Sebeskörös. Population (1900), 50,177.

GROTE, GEORGE, the historian of Greece, eminent also as a philosopher, a politician, and a laborer in the advancement of university education, was born November 17, 1794, at Clay Hill, near Beckenham in Kent. He drew his lineage from a Dutch, or, more strictly speaking, a Low German family. The name (Groot, equivalent to "great,") is the same as that of Hugo Grotius, with whom the Grotes would gladly have traced a relationship, but the evidence was wanting. Arrived at the age of manhood (in the winter of 1814-1815), he formed the acquaintance of the young lady who afterward became his wife, devoted to and worthy of him, the very complement of his life, intellectual as well as social, and finally his biographer in a spirit of loving but not indiscriminate admiration. This was Miss Harriet Lewin, the daughter of Mr. Thomas Lewin, of Bexley, in Kent, a gentleman of old family and independent fortune. She was born at Southampton, July 1, 1792, and was consequently nearly two years older than Grote. From causes which need not be related here, their intimacy was suspended for three years, during which Grote's studies made steady progress. The most interesting light is thrown on the method and course of his studies in the diary which he kept for Miss Lewin's information. This record bears witness, not only to the wide diversity of his studies in ancient and modern literature, philosophy and political economy, but also to the fact that he read the authors themselves whom he wished to know — read them as a whole, instead of merely reading what others had written about them.

An epoch, perhaps the most critical turning-point of Grote's intellectual life, was formed by his introduction, through David Ricardo, to James Mill, who was then composing his metaphysical work entitled *An Analysis of the Human Mind*. Already attracted to this study, Grote became Mill's admiring disciple in mental and political philosophy. The views derived from Mill were confirmed by the teaching of Jeremy Bentham, and by intercourse with a band of young disciples, over whom the two philosophers wielded an unbounded influence. Among these John Stuart Mill began now to make his appearance as a boy of twelve years old.

In 1820, at the age of twenty-four, Grote was married to Miss Harriet Lewin. They lived at first at the banking-house in Threadneedle street. The confined situation soon told on Mrs. Grote's health, and the death of her only child, a week after its birth, was followed by a dangerous illness. It was at her bedside at Hampstead, during her slow recovery, that Grote composed the first work he published, an *An Essay on Parliamentary Reform*, in reply to an article by Sir James Mackintosh in the *Edinburgh Review*, No. 61 (1821). The most important parts of this pamphlet were embodied in his later essay on the *Essentials of Parliamentary Reform* (1831), reprinted in his *Minor Works*.

In April, 1822, Grote sent a vigorous letter to the *Morning Chronicle* in reply to Canning's speech against Lord John Russell's motion for reform. In the same year he spent much time upon some MSS. of Jeremy Bentham, which the aged philosopher intrusted to his young disciple to put into a readable form. After carefully digesting and arranging them, he published them anonymously in a small 8vo volume. A circle of congenial minds frequented the house in Threadneedle street from 1822 to 1830. Within that choice society there was a narrower circle of students, who met there twice a week at half-past eight in the morning for an hour or two's reading. Among others were John Stuart Mill, Charles Buller, and John Arthur Roebuck. They read the most recent works on metaphysics and

kindred subjects in the light of their adored teachers, Bentham and James Mill, beyond whom they believed all to be in Cimmerian darkness.

The year 1823 marks the epoch of the first conception of Grote's great work; and an extant letter shows the spirit in which he approached it. On January 14th he writes: "I am at present engaged in the fabulous ages of Greece, which I find will be required to be illustrated by bringing together a large mass of analogical matter from other early histories, in order to show the entire uncertainty and worthlessness of tales to which early associations have so long familiarized all classical minds. I am quite amazed to discover the extraordinary greediness and facility with which men assert, believe, re-assert and are believed."

Meanwhile he gave the world an earnest of his work in an exhaustive review of Mitford's *History of Greece* in the *Westminster Review* for April, 1826—one result of which was a letter from Niebuhr, clearly designating Grote as the historian of Greece, and inviting him to a visit which events never permitted him to pay.

From 1825 to 1827 Grote took part in the scheme of founding the "University of London" in Gower street, with the management of which institution he became afterward intimately connected. As the political crisis of 1830 approached, public and private events conspired to draw Grote into the vortex of politics. The failure of his father's health gave him a new position in the bank; and, in the spring of 1830, he was able to arrange for a visit to the Continent, which brought him into connection with the liberal politicians of Paris on the eve of the revolution. He refused an invitation to stand for the city in 1831; but he made an able contribution to the argument in a statement of the *Essentials of Parliamentary Reform*, published this year, to which reference has already been made. His reluctance to enter parliament was overcome after the passing of the Reform Act in 1832; and, being returned at the head of the poll, he appeared as one of the members for the city of London in the first reformed parliament, which met on February 4, 1833. He at once gave notice of a motion for the vote by ballot in parliamentary elections, which he brought before the house on April 25th following. His speech on that occasion was prepared with great care, and displayed that cogent reason and calm earnest eloquence which marked all his efforts. He sat in three successive parliaments, from 1833 to 1841, witnessing the gradual passage from the first triumphs of reform to the Conservative reaction under Sir Robert Peel, and the steady decay of his own sect of philosophical radicalism, which never had a root in popular opinion. He was returned the last time by a bare majority of six, and his party in parliament numbered just the same figure.

During the eight years and a half of his parliamentary life, Grote kept up his varied reading, and formed a growing desire for a knowledge of physical science. But the staff of his mental diet, and his refuge from all meaner objects of thought, was still the same. In the weary intervals of attendance on parliament a copy of Plato was ready in his pocket, and, when snowed up in the country during the vacation, he writes—"A Greek book is the only refuge." His hospitalities expanded with his social position; and, among his new friendships, the one he most valued was that formed in 1835 with Mr. (afterward Sir) George Cornwall Lewis, the letters exchanged with whom on various points in classics and philosophy enrich the narrative of his *Life*. Among the other objects of his literary interest at that time was Sir William Molesworth's collected edition of the works of Hobbes, dedicated to Grote, whose review of the first two volumes in the *Spectator* (1839) is reprinted among the *Minor Works*.

During the whole period of Whig decay, and especially from the beginning of the present reign, Grote felt a declining interest in politics, and accordingly, on the dissolution in June, 1841, he determined to retire from parliament. Thus, at the age of forty-six, he was set free to spend the remaining thirty years of his life in the work long prepared and contemplated. In half that period the *History of Greece* was finished; the remaining half was devoted to the two works on Plato and Aristotle, which made up the Hellenic "trilogy" of his life-long studies.

After a six months' holiday (1841-1842), for the long desired purpose of visiting Italy and studying the antiquities of Rome upon the spot, he returned to his business at the bank, and set vigorously to work on the new plan for the first two volumes of his *History*—reperusing the authorities, revising his notes, and rewriting the whole. The greater part of these two volumes was occupied with the first division of his subject, which was now for the first time severed from actual history, and placed in its proper mythical light, under the title of *Legendary Greece*.

With the beginning of 1843, exactly ten years after the interruption caused by his entrance into parliament, the composition of the first volume for the press was vigorously begun; and at midsummer he further cleared his path by retiring from the banking-house of Prescott, Grote & Company. While still at work upon the *History*, he published in the *Classical Museum* (1844) an important essay on weights and measures, reviewing Boeckh's *Metrologische Untersuchungen*, which is reprinted among his *Minor Works*.

The first two volumes of the *History* were completed early in 1845, and published in March, 1846. The first volume and nearly half of the second are occupied with *Legendary Greece*; the latter half of the second volume begins *Historical Greece*, and consequently contains only a small portion of the real history. These volumes were reviewed with great praise by John Stuart Mill in the *Edinburgh Review*, and by Dean Milman in the *Quarterly Review*.

The success of the first two volumes incited Grote to prosecute the work with redoubled ardor; and such progress had been already made that the third and fourth volumes, bringing the narrative down to the battle of Marathon, and containing an account of Grecian poetry and philosophy in its earlier stages, appeared in the following year (1847). Two more volumes, the fifth and sixth, coming down to the eleventh year of the Peloponnesian war, were published in 1849. These two volumes, together with the two preceding ones, were reviewed in the *Edinburgh Review* by Sir George Cornwall Lewis. The seventh and eighth volumes, which brought the Peloponnesian war to the end, and which contained the striking and original view of the Sophists and of Socrates, appeared in 1850. Two articles in the *Quarterly Review* upon this portion of the work, one upon the history, and the other upon Socrates and the Sophists, were written by Dean Stanley. The ninth and tenth volumes were published in 1852, the eleventh in 1853, and the last and twelfth in 1856, just ten years after the appearance of the first two volumes. The work closes with the generation contemporary with Alexander the Great, "an epoch," the historian observes, "from whence dates not only the extinction of Grecian political freedom and self-action, but also the decay of productive genius, and the debasement of that consummate literary and rhetorical excellence which the fourth century B.C. had seen exhibited in Plato and Demosthenes."

After a well-earned holiday on the Continent in the summer of 1856, Grote set steadily to work upon his

Plato, which occupied him nine years, and appeared in 1865 in three volumes 8vo, under the title of *Plato and the other Companions of Sokrates*, when the author had completed his seventieth year. This work, he remarks, was "intended as a sequel and supplement to his *History of Greece*." After giving an exhaustive review of early Greek philosophy, from Thales to Democritus, and an account of the life of Plato, of the Platonic Canon, and of Platonic compositions generally, he analyses at great length each of the dialogues, with illustrative remarks, unfolding a number of his own philosophical views. The work concludes with two chapters, one on the "Other Companions of Sokrates," and another on "Xenophon."

On the completion of this work, Grote wrote in the *Westminster Review* (1866) an elaborate criticism of John Stuart Mill's *Examination of Sir William Hamilton's Philosophy*.

During the composition of the *Plato* and the *Aristotle* Grote resided in London, at 12 Savile Row, and in two country houses, which he occupied in succession, first at Barrow Green in Kent from 1859 to 1863 (where Jeremy Bentham had once lived), and afterward at Shiere among the Surrey hills, in which places his day was divided between regular work, exercise as regular, and the society of congenial friends. Many a work of social duty and benevolence found prompt performance; and he paid unremitting attention to the business of his three favorite institutions—the University of London, University College, and the British Museum, of which last he became a trustee on the death of Henry Hallam in 1859.

He continued to labor in the discharge of his duties to these institutions, even when far gone in the malady which appeared in 1870, and carried him off on June 18, 1871, in his seventy-seventh year. He found his fit resting-place in Westminster Abbey, just beneath Camden's monument, and near Macaulay's grave.

GROTEFEND, GEORG FRIEDRICH, to whose patience and ingenuity the decipherment of the cuneiform inscriptions was originally due, was born at Münden, in Hanover, June 9, 1775. He was educated partly in his native town, partly in Ilfeld, where he remained till 1795, when he entered the university of Göttingen, and there became the friend of Heyne, Tychsen, and Heeren. Heyne's recommendation procured for him an assistant mastership in the Göttingen gymnasium in 1797. While there he published his work, *De Pasigraphia sive Scriptura Universali* (1799), which first brought him into notice, and led to his appointment in 1803 as prorector of the gymnasium of Frankfort-on-the-Main, and shortly afterward as conrector. Grotefend was best known during his lifetime as a Latin and Italian philologist, though the attention he paid to his own language is shown by his *Anfangsgründe der deutschen Poesie*, published in 1815, and his foundation of a society for investigating the German tongue in 1817. In 1821 he became director of the gymnasium at Hanover, a post which he retained till his retirement in 1849, four years before his death. In 1823-4 appeared his revised edition of Wenck's Latin grammar, in two volumes, followed by a smaller grammar for the use of schools in 1826; in 1835-8 a systematic attempt to explain the fragmentary remains of the Umbrian dialect, and in 1839 a work of similar character upon Oscan. In the same year he published an important memoir on the coins of Bactria. He soon, however, returned to his favorite subject, and brought out a work in five parts, *Zur Geographie und Geschichte von Altitalien* (1840-2). Previously, in 1836, he had written a preface to Wagenfeld's translation of the spurious *Sanchoniathon* of Philo Byblius, which professed to have been discovered in the preceding year

in the Portuguese convent of Santa Maria de Merinhao. But it was in the East rather than in the West that Grotefend did the work which has given him a lasting name. The mysterious cuneiform inscriptions of Persia had for some time been attracting attention in Europe; exact copies of them had been published by the elder Niebuhr, who lost his eyesight over the work; and Grotefend's friend, Tychsen of Rostock, believed that he had ascertained the characters in the column now known to be Persian to be alphabetic. At this point Grotefend took the matter up. His first discovery was communicated to the Royal Society of Göttingen in 1800. Grotefend died December 15, 1853.

GROTIUS, HUGO, in his native country Huig van Groot, but known to the rest of Europe by the Latinized form of the name, was one of the famous men of the seventeenth century, almost equally eminent for public services and as a writer. He was born at Delft on Easter day, April 10, 1583.

In the annals of precocious genius there is no greater prodigy on record than Hugo Grotius, who was able to make good Latin verses at nine, was ripe for the university at twelve, and at fifteen edited the encyclopædic work of Marcianus Capella. At Leyden he was much noticed by J. J. Scaliger, whose habit it was to engage young friends in the editing of some classical text, less for the sake of the book so produced than as a valuable education for themselves. At fifteen Grotius accompanied Count Justin of Nassau, and the grand pensionary Oldenbarnevelt on their special embassy to the court of France. After a year profitably spent in that country in acquiring the language and making acquaintance with the leading men, Grotius returned home. He took the degree of doctor of law at Leyden, and entered on practice as an advocate.

Notwithstanding his successes in his profession, which seemed to open the most brilliant career to his ambition, he was in secret hankering after the pleasures of literature. In 1600 he edited the remains of Aratus, with the versions of Cicero, Germanicus, and Avienus.

In 1603 the United Provinces, desiring to transmit to posterity some account of their struggle with Spain, determined to appoint a historiographer. Several candidates appeared. Dominicus Bandius of course among them. But the choice of the states fell upon Grotius, though only twenty years of age, and not having offered himself for the post.

His next preferment was that of advocate-general of the fisc for the province of Holland and Zeeland. This was followed by his marriage, in 1608, to Mary van Reigesberg, a lady of family in Zeeland, who proved every way worthy to be the wife of Grotius.

He had already passed from occupation with the classics to studies more immediately connected with his profession. In the winter of 1604 he composed a treatise entitled *De Jure Prædæ*. This treatise he did not publish, and the MS. of it remained unknown to all the biographers of Grotius till 1868, when it was brought to light, and printed at the Hague under the auspices of Professor Fruin. It discovers to us that the principles and the plan of the celebrated *De Jure Belli*, which was not composed till 1625, more than twenty years after, had already been conceived by a youth of twenty-one. In the *De Jure Prædæ* of 1604 we have much more than the germ of the later treatise *De Jure Belli*. Its main principles, and the whole system of thought implied in the later, are anticipated in the earlier work.

On the death of Elias Oldenbarnevelt, Grotius, though only thirty, succeeded him as pensionary of the city of Rotterdam.

In 1613 he formed one of a deputation to the court of

England, for the purpose of adjusting those differences which were already beginning to arise between the two young maritime powers, and which gave rise afterward to a naval struggle disastrous to Holland. He was received by James with every mark of distinction due to his rising reputation. He also cultivated the acquaintance of the Anglican ecclesiastics Overal and Andrewes, and was much in the society of the celebrated scholar Isaac Casaubon, with whom he had been in correspondence by letter for many years.

After Grotius' return from England the exasperation of theological parties in Holland gradually rose to such a pitch that it became clear that an appeal to force would sooner or later be made. This Grotius must have foreseen, but he could hardly have anticipated that he himself would be one of the first and principal victims. To the orthodox Calvinists the word toleration was insupportable. They had the populace on their side. This fact determined the stadtholder, Maurice of Nassau, to support the orthodox party—a party to which he inclined the more readily since Oldenbarnevelt, the grand pensionary, the man whose uprightness and abilities he most dreaded, sided with the Remonstrants.

In 1618 Prince Maurice set out on a sort of pacific campaign, disbanding the civic guards in the various cities of Guelders, Holland, and Zeeland, and occupying the places with troops on whom he could rely. The states of Holland sent a commission, of which Grotius was chairman, to Utrecht, with the view of strengthening the hands of their friends, the Remonstrant party, into that city. Feeble plans were formed, but not carried into effect, for shutting the gates upon the stadtholder, who entered the city with troops on the night of July 26, 1618. There were conferences in which Grotius met Prince Maurice face to face, and taught him that Oldenbarnevelt was not the only man of capacity in the ranks of the Remonstrants whom he had to fear. On the early morning of July 31st, the prince's *coup d'état* against the liberties of Utrecht and of Holland was carried out; the civic guard was disarmed—Grotius and his colleagues saving themselves by a precipitate flight. But it was only a reprieve. The grand pensionary, Oldenbarnevelt, the leader of the Remonstrant party, Grotius, and Hoogevoerz were arrested by order of the stadtholder, brought to trial, and condemned—Oldenbarnevelt to death, and Grotius to imprisonment for life, and confiscation of his property. In June, 1619, he was immured in the fortress of Lovestein near Gorcum. His confinement was rigorous, but after a time his wife obtained permission to share his captivity, on the condition that if she came out, she should not be suffered to return.

Grotius had now before him, at thirty-six, no prospect but that of a lifelong captivity. He did not abandon himself to despair, but sought refuge in returning to the classical pursuits of his youth. The address and ingenuity of Madame Grotius at length devised a mode of escape. It had grown into a custom to send, at stated intervals, the books which he had done with, in a chest, along with his linen to be washed at Gorcum. For many months the warders of the fortress were very exact in searching the chest. But never finding anything but books and linen they grew careless, and began to let the chest pass without opening it. Madame Grotius, perceiving this, prevailed on her husband to allow himself to be shut up in it at the usual time. The two soldiers who carried the chest out complained that it was so heavy "there must be an Arminian in it." "There are, indeed," said Madame Grotius, "Arminian books in it." The chest was carried by canal to Gorcum. When it came there they wanted to put it on a sledge; but the maid telling the boatmen there

were some brittle things in it, it was put on a horse, and so carried to the house of a friend, where it was opened, and Grotius released. He was then dressed up like a mason with hod and trowel, and so conveyed in disguise over the frontier. His first place of refuge was Antwerp, from which he proceeded to Paris, where he arrived in April, 1621. In October he was joined by his wife. There he was presented to the king, Louis XIII., and a pension of 3,000 livres conferred upon him. French pensions were easily granted, all the more so as they were never paid. Grotius was now reduced to great straits. He had not the means of procuring the bare necessities of life. Under these circumstances the *De Jure Belli et Pacis* was composed. The biographers are naturally astonished by the fact that a work of such immense reading, consisting in great part of quotation, could have been written in little more than a year.

He was sent by Sweden on an embassy to France, but in 1645 he demanded and obtained his recall. He was received at Stockholm with all the honors due to him. But neither the climate nor the tone of the court suited him, and he demanded permission to leave. He was driven by a storm on the coast near Dantzic. He got as far as Rostock, where he found himself very ill. He died August 29, 1645.

GROTON, a post town of New London county, Conn., is situated on the Rivers Mystic and Pequonnock, opposite New London, and on the east side of the River Thames at its junction with Long Island sound. Population (1900), 5,962.

GROTTAGLIE, a small city of Italy, in the province of Lecce and circondario of Taranto, about fourteen miles northeast of Taranto.

GROUND, in painting, the coating or preparation put on the surface of the panel, board, or canvas on which a picture is to be painted. Artists attach great importance to the color and texture of the ground, as tending in no small degree to affect the technical quality of the work. The term ground is also applied to different parts of a picture, as the foreground, or portion of the picture on which are placed the figures or objects represented as nearest the spectator; background, the part particularly in portraits, behind or on which it is intended to set off or relieve the head, figure, or group depicted.

GROUND NUT (synonyms, earth nut, pistache de terre, monkey nut, pea nut, Manilla nut), a nut or pod the product of the *Arachis hypogaea*. The plant is an annual of diffuse habit, with hairy stem, with two-paired, abruptly pinnate leaflets. The flowers above ground are sterile, and the pods or legumes are stalked, oblong, cylindrical, about one inch in length, the thin reticulated shell containing one or two irregularly ovoid seeds. After the flower withers, the stalk of the ovary has the peculiarity of elongating and bending down, forcing the young pod under ground, and thus the seeds become matured at some distance below the surface. Hence the specific and vernacular names of the plant. Of the history of this plant much has been written. Monardes in 1596, writes of having seen it largely used about the river Marañon in Brazil, and Marcgraf in 1648, gave a description and figure of it. To M. Jaubert, however, a colonist at Gorée, near Cape Verd, seems to belong the honor of first recommending it as of commercial value. As to its native country the opinions of botanists are divided between Africa and America. It is extensively cultivated in all tropical and subtropical countries, especially in America, Africa, India, the Malayan Archipelago, and China. The plant affects a light sandy soil, and is very prolific, yielding in some instances thirty to thirty-eight bushels of nuts per acre.

GROUNDSEL, is an annual, glabrous or more or less woolly plant of the natural order *Compositæ*, series *Tubulifloræ* and tribe *Senecionideæ*, having a branched succulent stem six to fifteen inches in height; pinnatifid and irregularly and coarsely-toothed leaves; flowers in separate corymbs, with involucre of about twenty equal and several external and smaller bracts, and florets yellow and tubular, rarely ligulate in the marginal row; and ribbed and silky fruit. The plant is indigenous to Europe, whence it has been introduced into all temperate climates. It is a troublesome weed, flowering throughout the year, and propagating itself rapidly by means of its light feathery fruits; it has its use, however, as a food for cage-birds.

GROUSE, a word of uncertain origin, now used generally by ornithologists to include all the "rough-footed" Gallinaceous birds, but in common speech applied almost exclusively, when used alone, to the *Tetrao scoticus* of Linnaeus, the *Lagopus scoticus* of modern systematists—more particularly called in English the Red Grouse, but not a century ago almost invariably spoken of as the Moor-fowl or Moor-game.

We must notice the species of the genus *Bonasa*, of which the European *B. sylvestris* is the type. This does not inhabit the British Islands; unfortunately so, for it is perhaps the most delicate game-bird that comes to table. Like its transatlantic congener *B. umbellus*, the Ruffed Grouse or Birch-Partridge (of which there are two other local forms) it is purely a forest-bird. The same may be said of the species of *Canace*, of which two forms are found in America. Nearly allied to these birds is the group known as *Dendragapus*, containing three large and fine forms—all peculiar to North America. Then we have the Sage-cock of the plains of Columbia and California, and the Sharp-tailed Grouse, with its two forms, while finally, the Prairie-hen, also with two local forms, is a bird that in the United States of America possesses considerable economic value, as witness the enormous numbers that are not only consumed, but exported. The American Ruffed Grouse is found in all parts of the United States north of Georgia. In the Eastern States it is called partridge, in the Middle States pheasant, and in the West is known by its proper name. The Pinnated Grouse, or Prairie-hen, has been almost exterminated in the East, but is abundant on the Western prairies. Their meat is dark and inferior to that of the Ruffed Grouse.

GROVE. The almost universal occurrence, at one stage or another in the religious and social development of the races of mankind, of the practice of worshipping by preference under or among trees to which a peculiarly sacred and inviolable character is attached, is a fact too well known to require particular illustration here. Its explanation is to be sought partly in obvious considerations of physical convenience, but even more in certain psychical phenomena which may still be made matters of direct observation and experience. It does not appear to have any necessary connection with tree-worship, another very widely diffused practice, on which, and on its possible connection with ancestor-worship, some suggestive remarks will be found in Spencer's *Principles of Sociology*. It has sometimes been alleged as a characteristic difference between the Semitic and the Aryan races that the former show a tendency to select single trees for sanctuaries, while the latter are generally found worshipping in groves; and this generalization, though liable to many exceptions, is partly borne out at least by the familiar indications to be met with in scripture.

GRUBER, JOHANN GOTTFRIED, a learned German author, was born at Naumburg on the Saale, November

29, 1774. He received his education at the town school of Naumburg and the university of Leipsic, after which he resided successively at Göttingen, Leipsic, Jena and Weimar, occupying himself partly in teaching and partly in various literary enterprises, and enjoying in Weimar the friendship of Herder, Wieland and Goethe. In 1811 he was appointed professor at the university of Wittenberg, and after the division of Saxony he was sent by the senate to Berlin in connection with the negotiations for the union of the university of Wittenberg to that of Halle. After the union was effected he became in 1815 professor of philosophy at Halle.

GRÜN, ANASTASIUS, pseudonym for Anton Alexander, count of Auersperg, who was born April 11, 1806, at Laibach, the capital of the Austrian duchy of Carniola. He received his university education first at Gratz and then at Vienna, where he studied jurisprudence. In 1832 the title of "Imperial Chamberlain" was conferred upon him, and in 1839 he married the daughter of Count Attems. He accepted no official post, and devoted himself chiefly to literary pursuits. When the "March Revolution" broke out in 1848 at Vienna, the count entered the political arena, and represented the district of Laibach at the National Assembly at Frankfort-on-the-Main. After a few months, however, he resigned his seat, and again retired into private life. In 1860, when a fresh impulse was given to political life in Austria, he resumed his activity as a politician, and greatly distinguished himself in the Austrian House of Lords as one of the most intrepid and influential supporters of the cause of liberalism, both in political and religious matters, until his death in 1876. Count Auersperg acquired great fame as a poet, as which he is known under the pseudonym of *Anastasius Grün*.

GRÜN, HANS BALDUNG, a painter of the age of Dürer, was born about 1470 at Gmünd in Swabia, and spent the greater part of his life at Strasburg and Freiburg in Breisgau. The earliest pictures assigned to him are altar-pieces with the monogram H. B. interlaced, and the date of 1496, in the monastery chapel of Lichtenthal, near Baden. Another early work is a portrait of the Emperor Maximilian, drawn in 1501 on a leaf of a sketch-book now in the print-room at Carlsruhe. The *Martyrdom of St. Sebastian* and the *Epiphany* (Berlin Museum), fruits of his labor in 1507, were painted for the market-church of Halle, in Saxony. In 1509 Grün purchased the freedom of the city of Strasburg, and resided there till 1513, when he moved to Freiburg in Breisgau. There he began a series of large compositions, which he finished in 1516, and placed on the high altar of the Freiburg cathedral. He purchased anew the freedom of Strasburg in 1517, resided in that city as his domicile, and died a member of its town council in 1545.

GRUNBERG, or **GRÜNEBERG**, a town of Prussian Silesia, chief town of a circle in the government district of Liegnitz, is beautifully situated on an affluent of the Oder, and on the railway from Breslau to Stettin by Küstrin, thirty-six miles north-northwest of Glogau. Population (1901), about 15,000.

GRUNDTVIG, NIKOLAI FREDERIK SEVERIN, the Danish poet, statesman, and divine, was born at Udby on September 8, 1783, and studied at the free school of Aarhus until he went up to the university of Copenhagen in 1800. At the close of his university life he made Icelandic his special study, until in 1805 he took the position of tutor in a house on the island of Langeland. The next three years were spent in the study of Shakespeare, Schiller, and Fichte. His first work, *On the Songs in the Edda*, attracted no attention. Returning to Copenhagen in 1808, he achieved a greater success with his *Northern Mythology*, and in 1809 with

his *Decline of the Heroic Life in the North*. The boldness of his theological views having provoked opposition, he retired to a country parsonage for a while, but soon returned to pursue a literary career with extraordinary earnestness. From 1812 to 1817 he published five or six works, of which the *Rhyme of Røgskilde* is the most remarkable. From 1816 to 1819 he was editor of a polemical journal entitled *Dannevirke*, and in 1818 to 1822 appeared his Danish paraphrases of Saxo Grammaticus and Snorre. During these years he was preaching to an enthusiastic congregation in Copenhagen, but he accepted in 1821 the country living of Præstø, only to return to the metropolis the year after. His theological career was, however, presently stopped, for, having in 1825 published a brochure, *The Church's Reply*, against the popular Doctor Clausen, he was publicly prosecuted and fined. For seven years he was forbidden to preach, years which he spent in publishing a collection of his theological works, in paying two visits to England, and in studying Anglo-Saxon. In 1832 he obtained permission to preach again, and in 1839 he became priest of the workhouse church of Vartou Hospital, a post he continued to hold until his death in 1872.

GRUNEWALD, MATHIAS. The accounts which are given of this painter, a native of Aschaffenburg, are curiously contradictory. Between 1518 and 1530, according to statements adopted by Waagen and Passavant, he was commissioned by Albert of Brandenburg, elector and archbishop of Mainz, to produce an altarpiece for the collegiate church of St. Maurice and Mary Magdalen at Halle on the Saale; and he acquitted himself of this duty with such cleverness that the prelate in after years caused the picture to be rescued from the Reformers and brought back to Aschaffenburg. A later race of critics, declining to accept the statements of Waagen and Passavant, affirm that there is no documentary evidence to connect Grunewald with the pictures of Halle and Annaberg, and they quote Sandart and Bernhard Jobin of Strasburg to show that Grunewald is the painter of pictures of a different class.

GRUTER, or GRUYTÈRE, JAN, a critic and scholar of Dutch parentage by his father's side and English by his mother's, was born at Antwerp, December 3, 1560. To avoid religious persecution his parents while he was still young went to England; and for some years he prosecuted his studies at Cambridge, after which he went to Leyden, where he graduated M. A. In 1586 he was appointed professor of history at Wittenberg, but as he refused to subscribe the *formula concordie* he was unable to retain his office. From 1589 to 1592 he taught at Rostock, after which he went to Heidelberg, where in 1602 he was appointed librarian to the university. He died at Heidelberg, September 20, 1627.

GRUYÈRE, or GRUYERES, is a small pastoral district in the Swiss canton of Freiburg, noted for its cheese. (See *Freiburg*, Vol V., p. 2599). The old town of Gruyère, where the counts had their castle, had only 1,297 inhabitants according to the census of 1900, while the neighboring town of Bulle had 2,274.

GRYNÆUS, or GRYNER, JOHANN JAKOB (1540–1617), a learned theologian of the period immediately succeeding the Reformation, was born October 1, 1540, at Bern, where his father Thomas, nephew of Simon Grynæus, was at that time a teacher of theology, was educated at Basel, and in 1559 received an appointment as curate to his father, who had become pastor of Röteln in Baden. In 1563 he proceeded to Tübingen for the purpose of completing his theological studies, and in 1565 he returned to Röteln as successor to his father. Returning to Basel in 1586 as antistes or superintendent of the church there, he exerted for upward of twenty-five years a very considerable influence upon both the

church and the state affairs of that community, and acquired a wide reputation as a skillful theologian of the school of Zwingle. Five years before his death, which occurred August 13, 1617, he had the misfortune to become totally blind, but he continued to preach and lecture to the last.

GRYNÆUS, SIMON, a learned theologian of the Reformation, was born in 1493 at Vehringer; in his fourteenth year was sent to school at Pforzheim, and subsequently studied at the university of Vienna, where he graduated as master of arts and for some time acted as tutor. He next became rector of a school at Ofen (Buda). After an interval spent at Wittenberg with his old school friend Melancthon, he became professor of Greek in the university of Heidelberg in 1525; with the duties of this post he from 1526 combined those also of the Latin chair. In 1529 the friendship of Ecolampadius obtained for him a call to Basel as successor of Erasmus. On his return to Basel in 1531, the year of the death both of Zwingle and of Ecolampadius, he began as theological professor to give exegetical lectures on the New Testament; and in 1534 he was summoned by Duke Ulrich of Würtemberg to assist in the reformation there, and especially in the reorganization of the university of Tübingen. In 1536 he took an active part in the framing of the first Helvetic confession, and also in the conferences held with the purpose of inducing the Swiss to accept the concord of Wittenberg, which had also been drawn up in that year. He was the sole representative of the Swiss churches at the conference of Worms in 1540. His death took place suddenly at Basel on August 1, 1541.

GRYPHIUS, ANDREAS, German poet, was born at Grossglogau, Silesia, on October 11, 1616. His youth fell in the period of the Thirty Years' War, which began in 1618, when he was two years old. After spending five years at school in various towns, he returned to his native place in 1636, and became tutor in the family of Palsgrave George von Schönborn, who crowned him laureate and granted him a patent of nobility. In 1638 he went to the university of Leyden, where he spent six years, at first as a student, afterward as a tutor. Having traveled through France and Italy and lived a year in Strasburg, he went back to Silesia, and in 1650, at the age of thirty-four, was made syndic of the principality of Glogau. This office, the duties of which he faithfully discharged, he held till his death in 1664.

GUACHARO, the Spanish-American name of what English writers have lately taken to calling the OIL-BIRD, a very remarkable bird, first described by Alexander von Humboldt from his own observation and from examples obtained by Bonpland, on the visit of those two travelers, in September, 1799, to a cave near Caripé in the Venezuelan province of Cumaná on the northern coast of South America. A few years later it was discovered, says Latham, to inhabit Trinidad, where it appears to bear the name of *Diablotin*; and much more recently, by the receipt of specimens procured at Sarayacu in Ecuador, Caxamarca in the Peruvian Andes, and Antioquia in New Grenada, its range has been shown to be much greater than had been supposed. The singularity of its structure, its curious habits, and its peculiar economical value have naturally attracted no little attention. About as big as a Crow, its plumage exhibits the blended tints of chocolate-color and gray, barred and penciled with dark brown or black, and spotted in places with white, that prevail in the two families just named. The beak is hard, strong, and deeply notched, the nostrils are prominent, and the gape is furnished with twelve long hairs on each side. The legs and toes are comparatively feeble, but the wings are large. Its habits the Guachiaro is wholly nocturnal, slumbering by

day in deep and dark caverns which it frequents in vast numbers. Toward evening it arouses itself, and, with croaking and clattering which has been likened to that of castanets, it approaches the exit of its retreat, whence at nightfall it issues in search of its food, which, so far as is known, consists entirely of oily nuts or fruits. The Guacharo is said to build a bowl-like nest of clay, in which it lays from two to four white eggs, with a smooth but lusterless surface, resembling those of some Owls.

GUACO, HUACO, or GUAO, also Vejucó and Bejuco, terms applied to various Central and South American and West Indian plants, in repute for alexipharmic and curative virtues.

GUADALAJARA, a province of Spain, in New Castile, bounded on the north by the provinces of Segovia, Soria, and Saragossa, on the east by Saragossa and Teruel, on the south by Cuenca, and on the west by Madrid. The province is divided into nine administrative districts; but besides Guadalajara, the capital, it has no town of importance except the episcopal see of Sigüenza. The area is 4,869 English square miles; and the estimated population in 1898 was 199,290.

GUADALAJARA, a city of Spain, capital of the province of the same name, is situated on an elevation not far from the eastern bank of the river Henares, which is here spanned by a stone bridge built on Roman foundations in 1758. It is a station on the Madrid and Saragossa Railway, thirty-eight miles northeast from Madrid, and 2,395 feet above the level of the sea. Population (1900), about 9,000.

GUADALAJARA, or in the older spelling, GUADALAXARA, a city of Mexico, the capital of the state of Jalisco, is situated in the Atemarac valley not far from the Rio Grande de Santiago, about 280 miles west-northwest of the city of Mexico. Owing to its considerable elevation above the sea-level, Guadalajara enjoys an excellent climate. Guadalajara is a fairly busy town, with paper-mills and woolen and cotton factories; but all the principal establishments are in the hands of Frenchmen, Germans, or Englishmen. The confectionery of the town is held in high repute, and the Indians of the neighborhood are remarkable for the artistic ability with which they mold figures in clay or rags. The silk embroidery produced in the hospicio is also worthy of mention. Guadalajara was founded in 1531 by Nuñez Guzman, and was made a bishop's see in 1540. The population, which was only 19,500 in 1800, had increased to 46,804 by 1841, and to 83,934 in 1896.

GUADELOUPE, an island of the Antilles in the West Indies, belonging to France, is situated sixty-two miles from Martinique. The sailing distance from Brest is 3,750 nautical miles. A narrow channel, called La Rivière Salée, or Salt Stream, with a width of from 100 to 400 feet, separates the island into two portions, Guadeloupe proper or Basse Terre and Grande Terre. The former or western portion measures twenty-eight miles from north to south, and from twelve to fifteen miles from east to west, and its coast-line is estimated at eighty-seven miles. The latter or eastern portion measures twenty-two miles from north to south, and thirty-four from southeast to northwest, and its coast-line is estimated at one hundred and six miles. Basse Terre has a mountainous surface of volcanic origin, attaining its greatest altitude in La Soufrière, a still active volcano, 4,870 feet in height; while Grande Terre is generally flat, with no elevations higher than 115 feet, and consists entirely of calcareous formations.

Along with its dependencies, the smaller islands of Marie Galante, Désirade, and Les Saintes, Guadeloupe forms a separate colonial government.

Administratively the colony is divided into three

arrondissements of Basse Terre, Pointe à Pitre, and Marie Galante. The town of Basse Terre, situated in 15° 59' 30" N. latitude and 66° 24' 31" W. longitude, with a population of 12,000, is the capital, and the seat of the bishopric, which was founded in 1850; and Pointe à Pitre, situated in 16° 14' 12" N. latitude and 66° 11' 41" W. longitude, and containing a population of 16,000, is the principal port. A fine military harbor, popularly known as the Gibraltar of the Antilles, is situated in the group of Les Saintes.

During the twenty-five years from 1848 to 1872 the population of the colony remained almost stationary, the mean being only 132,000. Between 1873 and 1875 there was a notable increase, the mean for these years being 141,000. Pop. of island (1900), 172,100.

GUADIX, a city of Spain, in the province of Granada, situated on an elevated plateau on the northern slope of the Sierra Nevada, and above the left bank of the river Guadix. Population (1900), about 12,000.

GUADUAS, a town of Colombia, South America, state of Cundinamarca, is situated in the beautiful valley of the Magdalena, on the road between Bogota and Honda, forty-five miles northwest of the former town and more than 8,000 feet above sea-level. Population (1900), about 9,000.

GUAIAECUM, a genus of trees of the natural order *Zygophyllæ*. The guaiacum or lignum vitæ tree, is a native of the West Indies and the north coast of South America, where it attains a height of twenty to thirty feet. Its branches are numerous, flexuous, and knotted; the leaves opposite and pinnate, with caducous stipules, and entire, glabrous, obovate or oval leaflets, arranged in two or, more rarely, three pairs; the flowers are in axillary cymes, and have five oval pubescent sepals, five distinct pale-blue petals three times the length of the sepals, ten stamens, and a two-celled superior ovary; and the fruit is about three-fourths inch long, with a leathery pericarp, and contains in each of its two cells a single seed. Guaiacum in modern materia medica is used in cutaneous affections, especially in those of a syphilitic origin. It is a powerful diaphoretic, when the patient is confined to a warm chamber inducing profuse sweating, but when the patient is exposed to air acts more upon the urinary organs than upon the excretories of the skin. It is a valuable eliminative in rheumatism, neuralgia and kindred affections, aiding and stimulating the various organs in throwing off the poisonous elements contained in the diseased system.

The *lignum vitæ* of commerce, so named on account of its high repute as a medicinal agent in past times, when it was known as *lignum sanctum* and *lignum indicum*, *lignum guayanum*, or simply *guayacan*, is procured from *G. officinale*, and in smaller amount from *G. sanctum*. It is exported in large logs or blocks, generally divested of bark, and presents in transverse section very slightly marked concentric rings of growth, and scarcely any traces of pith; with the aid of a magnifying glass the medullary rays are seen to be equidistant and very numerous. The outer wood, the sapwood or alburnum, is of a pale yellow hue, and devoid of resin; the inner, the heartwood, or duramen, which is by far the larger proportion, is of a dark greenish-brown, contains in its pores 26 per cent. of resin, and has a specific gravity of 1.333, and therefore sinks in water, on which the alburnum floats. Owing to the diagonal and oblique arrangement of the successive layers of its fibers, the wood cannot be split; and on account of its hardness, density, and durability it is much valued for the manufacture of ships' pulleys, rulers, skittle-balls, mallets, and other articles.

GUALDO TADINO, a town of Italy, in the province of Perugia and circondario of Foligno, with a sta-

tion on the line from Ancona to Rome, about fifty-eight miles from the former city. Population about 8,500.

GAULEGUAY, a town of the Argentine republic, department of Entre-Rios, is situated on the Gualaguay river, which falls into the Parana, and is navigable up to this point, 120 miles north-northwest of Buenos Ayres. The population is about 10,000.

GAULEGUAYCHU, a city of the Argentine republic, department of Entre-Rios, is situated on the Gualaguaychú river, which there falls into the Uruguay, 120 miles north of Buenos Ayres. Like Gualaguay, it depends for its prosperity chiefly on the sheep and cattle grazed in the neighboring country, and its export trade includes beef, mutton, hides, wool, tallow, and bone manure. The population is about 15,000.

GUAMANGA. See **AYACUCHO**, page 693.

GUAN, a word apparently first introduced into the ornithologist's vocabulary about 1743, by Edwards, who said that a bird he figured was "so called in the West Indies," and the name has hence been generally applied to all the members of the Subfamily *Penelopina*, which are distinguished from the kindred Subfamily *Cracina* or Curassows by the broad postacetabular area of the pelvis. Like Curassows, Guans are in great measure of arboreal habit. They also readily become tame, but all attempts to domesticate them in the full sense of the word have wholly failed, and the cases in which they have even been induced to breed, and the young have been reared in confinement, are very few. Yet it would seem that Guans and Curassows will interbreed with poultry, and what is more extraordinary is that in Texas the hybrids between the Chicalacca and the domestic Fowl are figured to be far superior to ordinary Gamecocks for fighting purposes.

GUANACO, one of the four species of ruminant animals which represent in South America the camels of the East, and which resemble them in the possession of canine teeth in both lower and upper jaws. The Guanaco is the largest species, standing nearly four feet high at the shoulders. It is an elegant creature, with gracefully curved neck and long slender legs; its body is covered with long soft hair of a fawn color above and almost pure white beneath. It is found throughout the southern half of South America, from Peru in the north to Cape Horn in the south, but occurs in greatest abundance in Patagonia. It lives in herds usually of from six to thirty, although these occasionally contain several hundreds, while solitary individuals are sometimes met with. They are exceedingly timid, and therefore wary and difficult of approach; like many other ruminants, however, their curiosity sometimes overcomes their timidity, so as to bring them within range of the hunter's rifle. Their cry is peculiar, being described by Cunningham as something between the bellowing of a deer and the neigh of a horse. The chief enemies of the guanaco; according to the same authority, are the Patagonian Indians and the puma, as it forms the principal food of both. Its flesh is palatable, although wanting in fat, while its skin forms the chief clothing material of the gigantic Patagonians.

GUANAJUATO, or **SANTA FE DE GUANAJUATO**, a city of Mexico, capital of the state of Guanajuato, is situated at a height of 7,200 feet above the sea. Built as it is at the meeting-place of three mountain gorges, and obliged by lack of space to climb the underfalls of the surrounding heights, Guanajuato has a highly picturesque appearance. The Alhondiga de Granaditas, originally a corn magazine, was occupied as a fort in the war of independence, and acquired peculiar interest as the spot where the patriot Hidalgo met his death. Guanajuato, founded in 1554, owed its existence and prosperity to the fact that it is the center of the great-

est silver-mining district in the world. Of the individual mines perhaps the most famous is the Valenciana, with a shaft 2,000 feet deep, which is in process of being cleared of the water by which it has long been flooded. The population of the State (1900) which includes a considerable number of foreigners, was 1,065,317; of the town, 40,000.

GUANCAVELICA. See **HUANCAVELICA**.

GUANO. The deposits of guano, or *huanu*, known locally as *huaneras*, are found in characteristic condition and abundance upon a large number of the islands lying off Peru and upon certain parts of the mainland. They occur in Bolivia and to the north of Peru also, but are there generally poorer in quality, if not always less in quantity. For the production and preservation of good guano two conditions are requisite—a rainless or nearly rainless climate and abundance of fish in the waters of the ocean. Both conditions are fulfilled on parts of the Bolivian and Peruvian coasts. The penguins, gannets, divers, cranes, cormorants, flamingoes, and other fish-eating birds thus find ample supplies of food; while their excreta retain their soluble and more valuable constituents. But even Peruvian guano is not exclusively excrementitious, nor wholly the produce of birds. These marine and maritime *huaneras* are the breeding-places, the resorts, and the cemeteries not only of sea-birds, but of many other sea-animals—sea-lions, etc., frequenting many guano lands and islands, and adding considerably during life and when dead to the deposits. In Peruvian guano, it is true, the evidences of its origin are often obscure, but the somewhat complex sources of this material are well shown in the West-African guano islands. On these Mr. T. R. Eden found (1845) three varieties of guano, the lowest being a crust or rock guano, the next above this being a seal guano, containing much seal-fur, and the uppermost layer being a bird guano, in which there were many mummified bird skins and large quantities of feathers.

The dung of bats, which has been found in large quantities in many caverns, both in Europe and in certain parts of France, the Pyrenees and Italy, in New Zealand, and on the North American continent, has been designated "bat-guano." Further, the term guano, even when employed to describe the marine and maritime deposits previously mentioned, includes a considerable variety of substances very different in chemical composition and in manure value. For the deposits of guano occurring on the rainless or nearly rainless islands and coasts of Peru vary much in the proportion of their constituents—such variation being due less to differences in the origin of the deposits than to subsequent changes. Exposure to the action of the sea and of seaweed, and the pressure of superincumbent layers, are not without influence on the nature of the guano, very different qualities being found at different depths.

Although allusions to guano occur in the writings of travelers in the seventeenth and eighteenth centuries, the credit of directing the attention of Europe to this curious and useful product is due to Humboldt. In 1804 he brought from the Chincha Islands a specimen which Klaproth and then Fourcroy and Vauquelin analyzed. But it was not until the publication, in 1840, of Liebig's work on chemistry in its relations to agriculture and physiology had demonstrated the importance of artificial manures that a lively interest in this Peruvian fertilizer was awakened. In that year a firm of merchants of Lima sent a large cargo of guano to England; but it was not until 1842 that the regular trade in guano began.

For a long time the group of Peruvian islands known as the Chinchas furnished nearly all the guano that

found its way to Europe. When these deposits, amounting to seven million tons or more, were practically exhausted—only 150,000 tons of deep deposits remaining in 1872,—their further working was stopped except for use in Peru itself. Then the guanos on the Macabi and Huanape islands were exported to Europe, in four years (1870 to 1874) about one million tons having been shipped and about half a million tons remaining in 1875. Since then the Lobos islands, situated about seventy miles north of Macabi, have been worked, as have also the islands of the Ballestas group. Even in 1871 three-fourths of the cargoes of nitrogenous guano were from Huanape, but the amount of nitrogen generally present in them was rather low, often not exceeding 10 per cent. of "potential" ammonia, while the percentage of water was remarkably high—sometimes not less than 25 per cent. The Ballestas guanos of the same year were drier and contained one-third more nitrogen.

In spite of many testings and surveys, the amount of Peruvian guano still remaining to be exported has not been even approximately determined. Not only do contiguous deposits differ much in composition, but it is frequently impossible to ascertain what is guano and what is sand or rock. Sometimes the layers of guano are too thin to be worth removing, in other places they fill up ravines to a much greater depth than would be imagined. An estimate of the total quantity of Peruvian guano remaining in 1877 gave over two million tons available for commerce, but this figure presumably includes all varieties, both nitrogenous and phosphatic. Most of the guano lately and now exported comes from the following groups of islands, or places on the coast—Macabi, Huanape, Ballestas, Punta de Lobos, Pabellon de Pica, and Huanillos, and, since 1877, particularly from the last localities.

The following are among the more obvious characteristics of good Peruvian guano: Although at the present time it is by no means of uniform appearance or of constant composition, yet it may be stated that the best qualities, which most closely resemble the former supplies from the Chinchas, are light in color, do not weigh much more than sixty pounds per bushel, are friable, and do not cohere strongly when pressed between the fingers. Small soft lumps are often observed in good samples; when these are broken a white or pale-colored substance is seen in the center. This lighter-colored matter contains carbonate and other ammoniacal salts; in some adulterated samples its appearance is imitated by means of gypsum. The hard lumps found in guano are of very varying composition, some being highly phosphatic and others highly siliceous. The ash left on burning a good Peruvian guano is white or gray; a red ash generally indicates adulteration with ochre or ferruginous earth. An unusual proportion of water commonly points to damage by sea water or rain, a kind of injury which is the more serious, since it is usually accompanied by a considerable loss of ammonia. If more than a mere trace of chlorine be found in a sample of guano, damage by sea-water may be suspected. Although a good guano commonly contains more than half its weight of organic matter and of other substances driven off by a red heat, yet when a still larger quantity of such volatile matters is found their presence may be, and often is, a sign of admixture with peat.

GUARANA, so called from the Guarani, an aboriginal American tribe, the plant *Paullinia sorbilis*, Mart., of the natural order *Sapindaceae* and tribe *Sapindae*, indigenous to the north and west of Brazil. It has a smooth, erect stem; large pinnate alternate leaves, composed of five oblong-oval leaflets; inflores-

cence in narrow panicles of short-stalked flowers, having four or five sepals and four petals, eight stamens and a cylindrical three-celled ovary; and fruit ovoid or pyriform, about as large as a grape.

GUARANTEE, or GUARANTY, in English law, is a promise to be answerable for the debt of another, should he fail to make payment, or generally to be answerable for the performance of any duty by another person. The debt or duty must be owing by another, who is primarily bound, and the guarantor is only liable in the event of his failure of performance.

GUARANTEE ASSOCIATIONS, joint stock companies on the insurance principle, which become security for the integrity of cashiers, travelers, and other employees, on payment of an annual sum calculated either upon the salary or upon the amount for which the association holds itself liable. The advantage of the system is that it obviates the necessity of requesting private friends to become sureties.

GUARATINGUETA, a town of Brazil, in the province of São Paulo, situated near the right bank of the Parahiba, about forty miles northeast of the city of São Paulo. Population about 8,500.

GUARDI, FRANCESCO, a Venetian painter, was a pupil of Canaletto, and followed his style so closely that his pictures are very frequently attributed to his more celebrated master. Guardi sometimes colored Canaletto's designs. He had extraordinary facility, three or four days being enough for producing an entire work. Many of his works are to be found in England; seven in the Louvre; four, of exceptional merit, in the Manfrini Palace, Venice. He lived from 1712 to 1793.

GUARDIAN AND WARD. See INFANT.

GUARIENTO, sometimes incorrectly named Gueriero, was the first Paduan painter who distinguished himself. The only date distinctly known in his career is 1365, when, having already acquired high renown in his native city, he was invited by the Venetian authorities to paint a Paradise, and some incidents of the war of Spoleto, in the great council hall of Venice.

GUARINI, GIOVANNI BATTISTA, the author of the *Pastor Fido*, was born at Ferrara December 10, 1537, just seven years before the birth of Tasso. He was descended from Guarino of Verona (see next article). He inherited considerable wealth, and was able early in life to marry Taddea de' Bendedei, a lady of good birth. In 1567 he entered the service of Alphonso II., duke of Ferrara. When Tasso was condemned to S. Anna, the duke promoted Guarini to the vacant post of court poet. Abandoning this, Guarini retired in 1582 to his ancestral farm, the Villa Guarina, in the lovely country that lies between the Adige and Po, where he gave himself up to the cares of his family, the nursing of his dilapidated fortunes, and the composition of the *Pastor Fido*. In 1585 he was at Turin superintending the first public performance of his drama, whence Alphonso recalled him to Ferrara, and gave him the office of secretary of state. This reconciliation between the poet and his patron did not last long. Guarini moved to Florence, then to Rome, and back again to Florence, where he established himself as the courtier of Ferdinand de' Medici. Guarini finally took refuge in his native Ferrara, which, since the death of Alphonso, had now devolved to the papal see. Here, and at the Villa Guarini, his last years were passed in study, lawsuits and polemical disputes with his contemporary critics, until 1612, when he died at Venice in his seventy-fifth year.

The *Pastor Fido* is a pastoral drama composed not without reminiscences of Tasso's *Aminta*. The scene is laid in Arcadia, where Guarini supposes it to have been the custom to sacrifice a maiden yearly to Diana. But an oracle has declared that when two scions of

divine lineage are united in marriage, and a faithful shepherd has atoned for the ancient error of a faithless woman, this inhuman rite shall cease. The plot turns upon the unexpected fulfilment of this prophecy, contrary to all the schemes which had been devised for bringing it to accomplishment, and in despite of apparent improbabilities of divers kinds. It is extremely elaborate, and, regarded as a piece of cunning mechanism, leaves nothing to be desired. As a play, the *Pastor Fido* disappoints a reader.

GUARINO, or GUARINUS, of Verona, one of the Italian restorers of classical learning, was born in 1370, at Verona, and studied Greek at Constantinople, where for five years he was the pupil of Manuel Chrysoloras. He employed himself as a teacher of Greek, first at Verona and afterward in Venice and Florence; in 1436 he became, through the patronage of Lionel, marquis of Este, professor of Greek at Ferrara; and in 1438 and following years he acted as interpreter for the Greeks at the councils of Ferrara and Florence. He died at Ferrara December 14, 1460, aged ninety.

GUARINO, also known as VARINUS, and surnamed from his birthplace, FAVORINUS, PHAVORINUS, or CAMERS, lexicographer and scholar, was born at Fava, near Camerino, about 1450, studied Greek and Latin at Florence under Politian, and afterward became for a time the pupil of Lascaris. In 1514 Leo X. appointed him bishop of Nocera. In 1517 he published a translation of the *Apophthegmata* of Joannes Stobæus, and, in 1523, appeared his *Etymologicum Magnum*, a compilation which has been frequently reprinted, and which has laid subsequent scholars under great though not always acknowledged obligations. Guarino died in 1537.

GUASTALLA, a town of Italy, in the province of Reggio, at the influx of the Crostolo into the Po, about twenty-four miles northeast of Parma. Population of commune (1900), about 12,000.

GUATEMALA, or more rarely GUATIMALA, was formerly a captain-generalcy of Spanish America, which included the fifteen provinces of Chiapas, Suchitepeques, Escuintla, Sonsonate, San Salvador, Vera Paz and Peten, Chiquimula, Honduras, Nicaragua, Costa Rica, Totonicapan, Quetzaltenango, Solola, Chimaltenango, and Sacatepeques,—or, in other words, the whole of Central America and part of the present territory of Mexico. The name is now restricted to a small part of the area which constitutes an independent republic.

The area of Guatemala is estimated at 48,000 to 50,000 square miles; the population on January 1, 1901, was 1,574,340.

A large proportion of the country is mountainous. The main or central chain, usually considered a continuation of the Andes, has a mean elevation of about 7,000 feet. In the neighborhood of the capital it bears the name of Sierre de las Nubes; in the northwest it is known as the Sierre Madre.

Guatemala is richly watered, and on the western side a number of the rivers attain a very considerable development. Thus the Motogna, whose principal head stream is called the Rio Grande, has a course of about 250 miles, and is navigable to within ninety miles of the capital, which is situated on the Rio de las Vacas. Of similar importance is the Polochic, which is about 180 miles in length and navigable about twenty miles above the river-port of Telemán.

There are several extensive lakes in Guatemala, of which the Lake of Peten or Laguna de Flores, the Lake of Izabel are the most important.

Except in the marshy lagoons along the Pacific, which are inhabited by groups of fishermen and salt gatherers, the climate of Guatemala is considered a healthy one. The country may be rudely divided into a tropical or

low-lying region, a temperate or middle region, and a cold or elevated region. The tropical region, or *terro caliente*, extends from the level of the sea to an elevation of about 1,300 feet, the temperate, or *tierra templada*, from 1,300 to 4,900 feet, and the cold, or *tierra fria*, from 4,900 to 8,200 feet. Fortunately for the future of Guatemala the *templada* is by far the most extensive.

The fauna of Guatemala is more closely connected with the fauna of the South than with that of North America. There are hardly any animals dangerous to man to be found. Of the cat tribe, it possesses the jaguar, popularly called the tiger, the cougar, popularly called the lion. Several species of monkeys are found in the hot coast regions. Much annoyance is caused to the agriculturist by the little marsupial called the tanager, or the *Didelphys carinora*, its allied species. The bats are so numerous that villages were sometimes left to their undisputed occupancy. For the bird collector, there is a rich harvest in Guatemala. Snakes are met with in great variety, but only about a fourth of the species are venomous, and even the bite of the rattlesnake is said to be less deadly than in the north. Insect life is very prolific.

Most of the domestic animals of Guatemala—the horse, the ox, the goat, the sheep, the pig, the dog, the rabbit, the common fowl, the peacock, and the pigeon—are of European origin.

The constitution of Guatemala is republican and representative. The council of state consists of twenty-four members, elected by the house of representatives, which consists of fifty-two members, elected by the people. The parliamentary period, and the term of office for the president, who is at the head of the executive, is four years.

The regular army varies in strength according to the exigencies of the times. It did not exceed 2,000 in number in 1888, whereas the militia, well drilled and equipped with the best of modern arms, constitutes a force of 50,000 men.

The income of the government in 1900 was \$9,139,872, the outlay being an equal amount. The budget for 1901 estimates the expenditure at \$11,870,667. On December 31, 1900, the foreign gold debt stood as follows:—\$9,352,694; internal debt, in silver, \$28,118,068. The outstanding 5 per cent. loan of 1856, and the 6 per cent. loan of 1869, were converted April 30, 1888, into a 4 per cent. consolidated bonded sterling debt up to July 1, 1891, from which date the interest will be 4½ per cent., but the arrears of interest to be paid only at the rate of 72 per cent.

The national religion is the Roman Catholic, but there is absolute toleration of other creeds. The government pays a regular subvention to the church. Since the rise of the liberal government, great progress has been made in educational matters. The number of schools in the twenty-two departments in 1888 was 1,027, and the number of pupils attending 59,000. They are non-sectarian and compulsory.

In 1898 there were about 434 miles of railroad in running order, viz., the line connecting Guatemala with the port of San José, and the one between Retalhulen and the port of Champerico. The line from Puerto Barrios, on the Atlantic, to Guatemala, which latter city it is to connect with the Pacific, is about completed. A contract has been made for a line between Quetzaltenango and the port of Ocos. A few miles were in operation between Antigua, Guatemala, and Palín, as well as the branch line between Guatemala and El Guardo Viego.

The mail matter forwarded, in 1899, amounted to 5,684,613 items for home mails. The foreign mail matter

dispatched consisted in the same year of 186,796 ordinary letters and postal cards, 10,683 registered letters, and 442,845 newspapers and packages; together 640,324 items.

The length of wire of the national telegraphic system, in 1899, was 3,400 miles, with 150 offices, employing 259 telegraphers, and representing an investment of \$240,515. The number of messages sent in 1899 was 796,192, 152,757 being government dispatches. The aggregate receipts were \$187,712, and the expenses \$180,302. The number of cablegrams sent from the central office in 1887 was 2,457.

The roads are still in a very poor condition, and but little is done for their improvement. A great proportion of them become little better than mitigated swamps in the rainy season; many of the bridges are of the flimsiest construction and in a pitiable state of repair. Nearly a week in time is taken by ordinary wagons to accomplish the journey from San José to Esquintla, a distance of about ninety miles.

The total imports and exports during the five years, from 1896 to 1900 inclusive, between Great Britain and Guatemala, amounted to \$5,962,570 and \$6,888,500, respectively.

The duties collected in the five years aggregated \$8,541,960. Among the countries from which the goods were imported in 1887 Great Britain and the United States stand foremost.

The coffee export is the most important item of the foreign trade. It amounted in 1899 to \$7,390,477; other exports were of bananas, rubber, and hides. The sugar export in 1899 was in value \$250,360. To encourage rubber cultivation, the Republic has offered land owners grants of additional land (112 acres) from the national domain.

Of late the banana crop has excited much attention on the Atlantic coast. Favorable decrees on the part of the Government, by which land can be readily purchased at a low price (30 to 35 cents an acre) have stimulated this industry. Many Americans have settled in the section referred to, and either bought plantations already producing, or planted new ones. It is estimated that 250,000 banana plants were set out in 1888. The profits from a well-managed banana plantation are estimated at from \$75 to \$100 an acre each year. Bananas will come to perfection in their production in the course of twelve to sixteen months. The average cost per acre, up to the time of production, is \$25. The price paid at the port per bunch is 50 cents during seven months, and 37½ cents during five months in the year. During 1887, 117,514 bunches of this fruit were exported.

During the three years from 1886 to 1888 inclusive, there were imported into the United States from Guatemala goods to the amount of \$6,619,812, while the domestic export from the United States to Guatemala amounted to \$1,964,590.

The rise in coffee and growing property in Guatemala caused more liberal consumption of American goods. There entered the ports of the republic, 1887, 400 steamers and 38 sailing vessels, of an aggregate tonnage of 510,465. Among these vessels 347 sailed under the American flag, 39 under the British and 25 under the German.

In 1888 entire freedom in all commercial transactions between Guatemala and Mexico was established, and a mixed commission is to examine and adjudicate upon all claims made by Guatemalan citizens against Mexico.

The government of Guatemala encourages foreign immigration, but with no great success. While there arrived in 1887, through the ports and across the frontier, 4,346 individuals, 4,061 departed. Among those that arrived 2,824 were Central Americans, 410 Mexi-

cans, 177 from the United States, 118 Frenchmen and 124 Germans.

The treaty of commerce and navigation and consular convention concluded on September 20, 1887, between Guatemala and Germany, was ratified and exchanged at Guatemala on June 22, 1888.

Guatemala began to shake off the Spanish yoke in 1820. Four years later a confederation of the Central American States was effected, slavery abolished and a democratic constitution established. From 1829 till 1851 the young republic was under the rule of San Salvador and Honduras. In the latter year Guatemala recovered her independence under Carrera, who was appointed president till 1856, a dignity which was afterward bestowed upon him for life.

Carrera's successor was General Cerna, who was appointed president in 1865. In the struggle between Spain and Chili, Guatemala maintained a strict neutrality. The liberal party began to rise in influence about 1870, and in May, 1871, Cerna was deposed by Granados. The archbishop of Guatemala and the Jesuits were driven into exile as intriguers in the interest of the clerical party; and General Barrios having been chosen president in 1872, the order was declared extinct, and its property confiscated. In 1876 Barrios invited representatives from the other Central American republics to meet at Guatemala to deliberate on their amalgamation, but the commission separated amid a clash of arms, and war was soon raging between Guatemala, San Salvador and Honduras. Guatemala was enabled by her superior resources to come forth victorious from the conflict.

In 1887 President Barillas established a temporary dictatorship, which act led to a revolution. It had no success, however. The governments of Honduras and San Salvador acted loyally, and thus enabled Guatemala to overthrow the revolution. A number of the rebels were captured, tried by court-martial, and the ring-leaders were shot.

During 1887 and the following years a very healthy tone was observable in business matters in the republic. Agriculturists were jubilant at the abundance of the coffee crop, which, in 1887, yielded about 600,000 quintals. The coffee crops were the main cause of this flourishing condition, and generally a happy state of affairs prevailed.

In August the government decreed that all foreign merchandise, imported by vessels belonging to companies whose vessels made direct voyages, calling at the Pacific ports of the republic, shall receive a drawback of 3 per cent. on the present customs tariffs; but merchandise imported by steamers of lines already established, between San Francisco and Panama, shall only be allowed a reduction of 2 9-10 per cent. of such import duties.

A treaty concluded at Guatemala between the five republics of Central America was officially published on April 15, 1887. The aim of the convention there assembled was "to establish an intimate relationship between them, and, by making the continuance of peace certain, to provide for their future final fusion into one country." The treaty contains thirty-two articles, of which the most important are: That perpetual peace shall exist between the republics, and that in case any difficulties should arise among them, such difficulties shall be submitted to arbitration. All the republics bind themselves to respect the independence of each State, and to prohibit the preparation in any one of armed expeditions against any of the others. All citizens of the different States shall enjoy similar privileges and rights throughout all of them.

Citizens of any one of the Spanish-American republics

may become naturalized after one year's residence, and natives of other countries after three years' residence. All transport by land or sea between the contracting republics of all articles indigenous to or manufactured in them is permitted, and the articles mentioned will be exempted from all customs or taxes. Reciprocal freedom of navigation between the five countries is recognized, as is an equality in port privileges; civil, commercial and criminal suits are placed on an equality in each State. A general system among the five States of coinage, weights and measures, professional and consular rules, and of the penal and civil codes, is provided for. An international congress is to assemble every two years whereat the contracting parties will endeavor peacefully so to frame matters that ultimately the establishment of a Central American confederation may become possible.

GUATEMALA, properly SANTIAGO DE GUATEMALA, or GUATEMALA LE NUEVA, or the New, is the capital of the above republic. It is situated at a height of 5,270 feet above the sea in a fertile meseta or plateau, which is crossed by the valley of the Río de las Vacas or Cow River. Pop. (1895), 72,102. Like most Spanish-American towns it is laid out in wide and regular streets, and it has extensive suburbs. The houses, though usually of only one story, are solidly and comfortably constructed, and many of them are furnished with large gardens and courts. Among the open spaces the chief are the Plaza Mayor, which contains the cathedral, erected in 1730, the archiepiscopal palace, the Government buildings, the mint, and other public offices, and the Plaza de la Concordia, recently laid out by the Ministerio de Fomento, and now the favorite resort of the inhabitants. The theater, founded in 1858, which is one of the best of Central America, is situated in the middle of another square. Besides the cathedral, the most important churches are those of San Francisco, La Recolection or church of the La Recolects, La Merces, with a black image of the Virgin, greatly revered by the Indians, and Santo Domingo, the oldest church in the town.

Old Guatemala, frequently called merely Antigua, was destroyed by the Volcan de Agua in 1774, but still remains the chief town of the department of Sacatepequez. It is situated in a beautiful valley in 14° 32' 58" N. latitude and 90° 44' 5" W. longitude. Till the fatal outbreak of the volcanic forces it was one of the richest and most beautiful cities of Spanish America, possessing about 100 churches and convents and more than 60,000 inhabitants. The ruins are still almost majestic, and many of the buildings appear as if they had been fortresses. Among those best preserved are the ancient residence of the Spanish governors, now occupied by the administration, and the university building, now the national college. Great damage was done to the place by the earthquake of September, 1874. The population is about 20,000. An older Guatemala was situated at Ciudad Vieja or Almalonga, but seventeen years after it was founded by Alvarado it was carried away by the great inundation to which the Volcan de Agua owes its name.

GUAVA is the name applied to the fruits of species of *Psidium*, a genus belonging to the natural order *Myrtaceae*. The species which produces the bulk of the guava fruits of commerce is a small tree from fifteen to twenty feet high, a native of the topical parts of America and the West Indies. It bears short-stalked egg-shaped or oblong leaves, with strongly marked veins, and covered with a soft tomentum or down. The flowers are borne on axillary stalks, and the fruits vary very much in size, shape, and color, numerous forms and varieties being known and cultivated. The variety whose fruits are most valued is that which is sometimes

called the white guava. The fruits are pear-shaped, about the size of a hen's egg, covered with a thin bright yellow or whitish skin filled with soft pulp, also of a light yellowish tinge, and having a pleasant sweet-acid and somewhat aromatic flavor.

GUAYAQUIL, or SANTIAGO DE GUAYAQUIL, the principal seaport of the republic of Ecuador, South America, is situated on the western bank of the Guayaquil river, about twenty miles from its mouth. It has a population (1900) of about 55,000.

Saniago de Guayaquil was so called because it was founded on St. James' Day, July 25, 1531. Declared a city by Charles V. on October 6, 1535, it was officially constituted the same year by Balacazar, and two years later it was restored by Francesco Orellana. In the course of the seventeenth and eighteenth centuries the main facts in its history are the attacks of pirates and disasters by fire. The Dutchman Jacob Clark was the assailant in 1624, the Frenchman David in 1686-7, William Dampierre in 1707, and Clapperton in 1709. As late as 1741 the only defenses were three different forts in the river; but in 1763 the town was made the seat of a government, and a good castle and other fortifications were constructed. The following year a great fire destroyed property to the value of 2,000,000 pesos. In 1837 Guayaquil was made the see of a bishop.

GUAYRA, LA, or LA GUAIRA, a town of Venezuela, in the province of Caracas, about eight miles from the city of Caracas. population about 25,000.

GUBBIO, a city of Italy, in the province of Umbria, about twenty miles north of Perugia. Population of city, 6,000, of commune, 23,000.

GUBEN, a town of Brandenburg, Prussia, capital of a circle in the government district of Frankfort, is situated at the confluence of the Lubist with the Neisse and at the junction of three different railways, twenty-eight miles south-south-east of Frankfort. Population about 25,000.

GUDGEON, a small fish of the family *Cyprinidae* (see ICHTHYOLOGY), with narrow, cylindrical body and with a small barbel at each corner of the mouth.

GUELDERLAND, GELDERLAND, or GUELDERS, formerly a duchy of the empire bounded by Friesland, Westphalia, Brabant, Holland and the Zuydersee. At the beginning of the Christian era the land was held by Batavians and Chamavians, and a few centuries later both Saxons and Franks were added to its population. The Carolingian kings ruled over it by means of a number of counts, among whom those of Hameland, Teisterbant (Testrebante), and Nimeguen were the most prominent. In 1339 Duke Remald received the hereditary title of duke of Guelderland from the emperor Louis of Bavaria. On February 23, 1473, Charles the Bold became duke of Guelderland. The town of Nimeguen made an heroic effort to oppose the Burgundian accession, but it fell after a lengthened siege. On Charles' death at the battle of Nancy, in 1477, a party in the powerful city of Ghent became anxious to marry Charles of Egmont to their princess, Mary of Burgundy. Before the year was out, however (June 29, 1477), the young man had perished before the walls of Tournay, against which he had led an army of Burgundians and Flemings to recover it from the French. By his marriage with the Princess Mary, Maximilian of Austria considered himself the rightful possessor of Guelderland, and he succeeded by 1482 in quelling all opposition. But ten years later, young Charles of Egmond, the son of Adolphus, set foot once more in his native country, the people soon flocked to his standard; and victorious campaigns proved the capacity of the leader and the enthusiasm of the

soldiers. The fierce contest continued for years, and Charles carried the war into the enemy's territories. In 1507 he pushed into Holland and Brabant, in 1512 appeared before Amsterdam, and in 1514 made capture of Groningen. It was not till 1528 that Charles V. granted him the lifelong occupation of Guelderland, Zutphen, Groningen, Coevorden and Drenthe. On the rise of the Dutch republics most of Guelderland threw off the Spanish yoke. One "quarter" only, that of Roermonde, continued subject, and it received the name of Spanish Guelderland; the other three "quarters," Nimeguen, Zutphen and Arnheim, became Dutch Guelderland, and had their provincial diets twice a year. By the peace of Utrecht, Spanish Guelderland, or the Upper Quarter (Overkwartier), passed to Prussia, including the town of Gelders, but excluding Venloo, which went to the Netherlands, and Roermonde, which went to Austria. By the peace of Paris (1814) the temporary divisions of the French revolutionary period were abolished, and all Guelderland was incorporated with Holland, except the portion which still forms the Prussian circle of Düsseldorf.

GUELDERLAND, the modern province of the Netherlands, has an area of 1,965 square miles, and its population in 1900 is given at 572,787. The largest towns are Nimeguen (44,034), Arnheim (57,498), Zutphen (14,513), Apeldoorn (26,738), Ede (10,982), and Rheden (10,536); and there are at least eighteen other communes with more than 5,000 inhabitants.

GUELDER ROSE, so called from Guelderland, its supposed source, termed also Marsh Elder, Rose Elder and Water Elder, is a shrub or small tree of the natural order *Caprifoliaceæ*, and a native of Britain and other parts of Europe, and of Russian Asia. It is common in Ireland, but rare in Scotland. In height it is from six to twelve feet, and it thrives best in moist situations. The leaves are smooth, two to three inches broad, with three to five unequal serrate lobes, and glandular adnate stipules.

GUELDERS, or GELDERN, a town of Rhenish Prussia, in the government district of Düsseldorf, chief and only town of the circle of Geldern, is situated on the Niers, twenty-eight miles northwest of Düsseldorf. Population about 6,000.

GUELF and Ghibellines. The names Guelpho and Ghibellino, as applied to the parties in Italy, are Italianized forms of names which at an earlier period designated parties in Germany. Guelpho is the Italian form of Welf, and Ghibellino the Italian form of Waiblingen, a castle of the emperor Conrad. In Germany these names, which are said to have been first used as battle-cries at the battle of Weinsberg in 1140, designated the struggle between the Welfs of Altdorf and the imperial line of the Hohenstaufen. In Italy the names acquired a different meaning, being generally applied respectively to the party of the pope and the party of the emperor. The conflict between the authority of the emperor and the independence of the Italian towns began before the names were used in Germany. These parties first came into prominence in the Lombard league of 1167.

To give a full account of the party quarrels of Guelph and Ghibelline would be to write the history of mediæval Italy. The names began to die out gradually at the beginning of the fifteenth century. Twenty years before, the two parties had united in opposing John of Bohemia. The expedition of Charles IV. into Italy destroyed what shreds still remained of respect for the authority of the empire, and with the extinction of Ghibellinism Guelphism perished also; yet we find the name of Guelph appearing in Milan in 1404, after the death of Gian Galeazzo Visconti, and also in 1447, in the struggle between

Ludovico Sforza and the Duchess Bona of Savoy. In the conquest of Milan by Louis XII., in the beginning of the sixteenth century, we find the supporters of the emperor and Sforza called Ghibellines by Roman writers, and the French party called Guelph.

GUELPH, capital of Wellington county, in the Province of Ontario, is situated on the Speed river and the Grand Trunk railroad, forty-nine miles west of Toronto. The city is built upon a series of hills. It contains six banks, two daily and two weekly papers, besides a monthly publication, nine churches, preparatory and grammar schools, academies, a reading room and library, a number of hotels, public halls, stores, etc. The manufactures embrace woollens, hosiery, flax, sash, doors and blinds, furniture, agricultural implements, flour, oat meal, axles, carriage goods, hardware specialties, etc. Population, (1901), 11,496.

GUERCINO. See BARBERI.

GUÉRET, a town of France, chief town of the department of Creuse, is situated on a mountain declivity near the Creuse, about 250 miles south from Paris. Population 5,000.

GUERICKE, OTTO VON, an experimental philosopher, distinguished by his original discoveries of the properties of air, was born at Magdeburg, in Prussian Saxony, November 20, 1602. Having studied law at Leipsic, Helmstadt, and Jena, and mathematics, especially geometry and mechanics, at Leyden, he visited France and England, and, returning to Saxony, took up the profession of engineer-in-chief at Erfurt. In 1627 he was elected alderman in Magdeburg, and in 1646 mayor of that city, and a magistrate of Brandenburg. It was while holding these offices that Guericke devoted his leisure to scientific pursuits, especially in pneumatics. Incited by the discoveries of Galileo, Pascal, and Torricelli, he attempted the creation of a vacuum, a desideratum in science from before Aristotle. He began by experimenting with a pump on water placed in a barrel, but found that when the water was drawn off the air permeated the wood. He then took a globe of copper fitted with pump and stopcock, and discovered that he could pump out air as well as water. Thus Guericke became the inventor of the air-pump (1650). This important discovery was publicly explained before the emperor Ferdinand III. at the imperial diet which assembled at Ratisbon in 1651. Guericke at the same time illustrated in a simple but effective way the force of atmospheric pressure. Placing side by side two hollow hemispheres of copper, he exhausted the air from between them by means of pump and stopcock, and it is recorded that thirty horses, fifteen back to back, were unable to pull them asunder. The apparatus used on this occasion is still preserved in the imperial and royal library at Berlin. Guericke further demonstrated, by the aid of the air-pump, that in a vacuum all bodies fall equally fast, that animals cannot exist therein, and other phenomena. He also invented the air-balance, and the anemoscope, a species of weathercock. The discovery of the property of electro-repulsion is also attributed to him; and he made successful researches in astronomy, predicting the periodicity of the return of comets. In 1681 he gave up office and retired to Hamburg, where he died May 11, 1686.

GUÉRIN, GEORGES MAURICE DE, a French poet, whose few compositions in prose and verse, published posthumously, showed him to have possessed a true and rare genius, was descended from a noble but poor family, and was born at the château of Le Cayla, in Languedoc, August 4, 1810. He was educated with a view to the church at a religious seminary at Toulouse, and then at the Collège Stanislas, Paris, after which he pro

cured entrance to the society of La Chesnaye, in Brittany, founded by Lamennais, bishop of Rennes. He died July 13, 1839.

The name of EUGÉNIE DE GUÉRIN (1805–1848), the sister of Maurice, cannot be omitted from any notice of him, if only on account of the ties of love which united them; but her *Journals*, published in 1861, English translation 1865, and her *Lettres*, published in 1864, English translation 1865, indicated the possession of gifts of as rare an order as those of her brother, though of a somewhat different kind.

GUÉRIN, JEAN BAPTISTE PAULIN (1783–1855), French painter, belongs to the group who specially represent the Restoration. In 1810 Guérin made his first appearance at the Salon with some portraits, which had a certain success. In 1812 he exhibited *Cain after the murder of Abel*, and, on the return of the Bourbons, was much employed in works of restoration and decoration at Versailles. His *Dead Christ* (Cathedral, Baltimore) obtained a medal in 1817, and this success was followed up by a long series of works, of which the following are the most noteworthy: *Christ on the knees of the Virgin*, 1819; *Anchises and Venus*, 1822; *Ulysses and Minerva*, 1824; *The Holy Family*, 1829, and *Saint Catherine*, 1838. Guérin died January 19, 1855.

GUÉRIN, PIERRE NARCISSE (1774–1833), French painter, was born at Paris, May 13, 1774. The first teacher of Guérin was Nicolas Brenet, whom he left to place himself under Jean Baptiste Regnault, the representative, as contrasted with David, of a distinct form of the classic reaction modified by a tincture of Italian tradition. Guérin became the most distinguished of his pupils, and carried off one of the three "grands prix" offered in 1796, in consequence of the competition not having taken place since 1793. The pension was not indeed re-established, but Guérin fulfilled at Paris the conditions imposed upon a *peninsulaire*, and produced various works, one of which brought him prominently before the public. This work, *Marcus Sextus* (Louvre), exhibited at the Salon of 1799, excited wild enthusiasm, partly due to the subject—a victim of Sulla's proscription returning to Rome to find his wife dead and his house in mourning—in which an allusion was found to the actual situation of the *émigrés*. In 1802 Guérin produced *Phædra and Hippolytus* (Louvre); in 1810, after his return to Paris, he again achieved a great success with *Andromache and Pyrrhus* (Louvre); and in the same year also exhibited *Cephalus and Aurora*, and *Bonaparte and the Rebels of Cairo*. The *Restoration* brought to Guérin fresh honors; he had received from the first consul in 1803 the cross of the legion of honor, and in 1815 Louis XVIII. named him Academician. Baron Guérin died on July 6, 1833, and was buried in the church of La Trinité de' Monti by the side of Claude Lorraine.

GUERNSEY, the second in size of the Channel Islands, thirty miles west of Normandy, and eighty-one miles south of Portsmouth. The total area at low water is estimated at 12,605 acres, or rather more than twenty-two square miles, and of this about 10,000 acres are under cultivation.

For administrative purposes Guernsey is united with Alderney, Sark, Herm, and the adjacent islands in the bailiwick of Guernsey. The island proper is divided into ten parishes. The administration is under the supervision of a lieutenant-governor appointed by the crown; and the parliamentary assembly consists of a bailiff, twelve jurats, a procureur or attorney-general, the benefited clergy, and twelve delegates elected by the people. Taxation is very light, and the annual revenue amounts to about £10,000. Ecclesiastically the island is a deanery of the Winchester diocese of the

Church of England. The only town of any importance is St. Peter Port on the eastern coast. The population of Guernsey (1901) was 43,045. The island is usually identified with the Sarnia of the latter Roman writers. Its present name would appear to be a corruption of the Norse for Green Isle. For details on its history see CHANNEL ISLANDS.

GUERRAZZI, FRANCESCO DOMENICO, Italian writer and politician, was born at Leghorn, August 12, 1804. He studied law at Pisa, and became acquainted there with Byron, who produced a very strong impression on his lively imagination. In 1827 he published his first novel, *The Battle of Benevento*, a work displaying powerful imagination and strong patriotic feeling. While exiled in 1834 to Portoferraio, on the island of Elba, he wrote *Isabella Orsini* and *The Siege of Florence*, the latter producing great enthusiasm in Italy. In 1844 Guerrazzi was again exiled to Portoferraio. When the revolution broke out in 1848, he was named deputy, then president of the counsel of ministers, and finally, in the beginning of 1849, along with Montanelli and Mazzoni, triumvir and dictator of Tuscany. He had to expiate these few months of power by years of imprisonment and exile. He was banished first to Corsica, where he wrote *Beatrice Cenci*, *The Tower of Nonza*, and *Fides*, and then to Genoa. When the kingdom of Italy was constituted, Guerrazzi was several times sent to parliament as deputy. Toward the end of his life he withdrew to a villa he had on the seashore, near Cecina, not far from Leghorn, where he wrote his novel entitled *The Dying Century*. He died there on September 25, 1873, and was buried in the church of Montenero, near Leghorn.

GUERRERO, formerly TIXTLA, the chief town of the state of Guerrero, Mexico, is situated at an elevation of about 5,000 feet in a narrow and unhealthy valley in the Sierra Madre, twenty-eight miles from the coast and one hundred and fifty miles southwest of the City of Mexico. Pop. of state (1900), 474,594.

GUESCLIN. See DU GUESCLIN.

GUEVARA, ANTONIO DE, Spanish chronicler and moralist, was a native of the province of Alava, and passed some of his earlier years at the court of Queen Isabella. In 1528 he entered the Franciscan order, and he afterward accompanied Charles V. during his journeys and residences in Italy, and in other parts of Europe. After having held successively the offices of court preacher, court historiographer, bishop of Guadix, and bishop of Mondoñedo, he died in 1545.

In Spanish literature occurs also the name of LUIS VELEZ DE GUEVARA (1570–1644), who is said to have written nearly 400 comedies, of which, however, only a few, and these of little value, have been preserved. This Guevara is chiefly noteworthy as having been the author of a prose romance entitled *El Diable Cojuelo*, which suggested to Le Sage the ideas and materials of his *Diable Boiteux*.

GUGLIELMI. There are several Italian musicians of this name, the most celebrated of them being Pietro, born at Massa Carrara in May, 1727. He received his first musical education from his father, and afterward studied under Durante at the Conservatorio di San Loretto, Naples. His first operatic work was produced at Turin in 1755, and the success was such as falls to the lot of few primary efforts. Guglielmi's reputation was thenceforth established, and soon his fame spread beyond the limits of his own country, so that in 1762 he was called to Dresden to conduct the celebrated opera there. He remained for some years in Germany, where his works met with much success, but the greatest triumphs were reserved for him in England. He went to London in 1772, and stayed there five years, return-

ing to Naples in 1777. He still continued to produce operas at an astounding rate, but was unable to compete successfully with the younger masters of the day. In 1793 he became maestro di capella at St. Peter's Cathedral, and died at Rome, November 19, 1804.

GUIANA, GUYANA, or GUAYANA, an extensive territory in the northeastern part of South America, comprehending in its widest acception all the extent of country lying between the rivers Amazon and Orinoco from $3^{\circ} 30'$ S. to $8^{\circ} 40'$ N. latitude, and from $50^{\circ} 22'$ to $68^{\circ} 10'$ W. longitude. It is bounded on the north by the Orinoco and the Atlantic, east by the Atlantic, south by the rivers Negro and Amazon, and west by the Orinoco and the Cassiquiare. Its greatest length from east to west is about 1,200 miles, its greatest breadth, from the mouth of the Orinoco to the confluence of the Rio Negro with the Amazon, about 800 miles; and the estimated area is 690,000 square miles. This vast territory is divided into Brazilian (formerly Portuguese) Guiana, Venezuelan (formerly Spanish) Guiana, and Colonial Guiana. The first two divisions, comprising about five-sixths of the entire region, are claimed by or included in Brazil and Venezuela, respectively; and, stretching eastward from the mouth of the Orinoco toward that of the Amazon, lie the territories of British, Dutch and French Guiana.

Columbus, in 1498, decided that the Orinoco must flow through some vast continent. Vincent Yanez Pinzon, a Spanish navigator, is believed to have first sailed up the Amazon from the coast. Vasco Nuñez landed on the coast of Guiana in 1504, but the discovery is also claimed for Diego de Ordaz, one of the captains of Cortez, in the conquest of Mexico in 1531. Sir Walter Raleigh ascended the Orinoco in 1595 in search of the El Dorado. The first settlement is stated to be that of some Dutch people in 1580 near the river Pomeroon. This possession was contested by the Spaniards, but, in 1613, a colony of Zealanders on the banks of the Essequibo was reported in a flourishing condition. English, and subsequently French, colonization was attempted up the Surinam river. The English returned in 1652 to Paramaribo, and, in 1662, the whole colony was granted by Charles II. to Lord Willoughby. In 1669, however, Dutch Guiana covered all the territory now divided into British, Dutch and French. In 1712 the French attacked the settlement, and exacted a contribution. In 1732 Berbice received a constitution from the states-general, and, in 1763, there was a formidable insurrection of negro slaves who had been introduced from Africa. In 1781 Rodney took possession; and, though the colonies were restored to Holland in 1783, they surrendered again to the British in 1796. The Dutch resumed authority in 1802, and, in 1803, the proper history of British Guiana began.

BRITISH GUIANA, when finally acquired in 1803, and formally ceded in 1814, consisted of the three colonies, Demerara, Essequibo and Berbice, so named after the principal rivers which drain them. These were consolidated into one colony in July, 1831. It is bounded on the north and northeast by the Atlantic, east by Dutch Guiana, from which it is separated by the river Corantyn; south by Brazil, and west by Venezuela. It has an estimated area of 120,000 square miles, but the boundaries were till recently disputed by Venezuela and Brazil. An engagement, however, exists between the British and Venezuelan governments that neither shall occupy territory claimed by both. Pop. 280,000.

DUTCH GUIANA or SURINAM, lies to the east of British Guiana, from which it is separated by the Corantijn or Corantyn in $57^{\circ} 5'$ W. longitude. Its coast extends for upward of 220 miles to the mouth of the Maroni or Marowijne, which forms the boundary to-

ward French Guiana. The Dutch claim possession of 46,060 square miles; but of this extensive area, equal to more than four times that of Holland, not more than 3,230, according to Wolbers, had been explored in 1868, the colonial territory did not comprise more than 640 square miles, and the actual area under cultivation was little over 200. The principal settlements have been made in the lower valley of the Surinam, or between that river and the Saramacca on the west and the Commewijne on the east. At its mouth the Surinam is three miles broad; pop. of Paramaribo, the capital (1900), 31,427. Ships of from eighteen to nineteen feet of draught can reach the anchorage in front of the town, which has room for one hundred vessels.

FRENCH GUIANA is bounded on the west by the Maroni or Marowijne, which separates it from Dutch Guiana. Toward the south and east its limits are still uncertain. According to the treaty of Utrecht in 1713 it was to be bounded toward Brazil by the river of St. Vincent Pinzon, but the identification of this river has never been officially determined. The Oyapock is accepted provisionally by both countries, but the French claim that the Arouari is the real St. Vincent Pinzon, and consequently that they have a right to the country for 100 miles further south along the coast. Between the Maroni and the Oyapock the coast line is about 130 miles. The fourteen quarters of the colony are estimated to have an area of 5,952 square miles, but if the frontier be pushed back to the watershed, the whole area of the county could not be less than 30,500 square miles. Pop. 30,300.

GUIBERT, of Nogent, a theological and historical writer, who flourished at the close of the eleventh and the beginning of the twelfth century, was born on Easter Eve, 1053. Dedicated from infancy to the service of God and the Virgin, he received his early education at the Benedictine abbey of Fley (Flaviacum) or St. Germer, in the diocese of Beauvais. He was largely influenced by personal intercourse with Anselm, afterward of Canterbury. Encouraged by his friend, he devoted his energies to Old Testament exegesis, and wrote a commentary upon the narrative of the creation; this was followed by other literary works, both in verse and in prose. In 1104, when he had completed his fiftieth year, he was chosen to be the head of the abbey of Notre Dame de Nogent. He died in 1124.

GUIBERT, or WIBERT (c. 1030-1100), of Ravenna, better known as the antipope Clement III., was born of noble parents in the eleventh century at Parma, where, on attaining the canonical age, he entered the priesthood. During the minority of Henry, Guibert was appointed by the empress Agnes to the chancellorship of the kingdom of Italy; and in this capacity he steadfastly resisted, in the interests of the crown, the innovations of Hildebrand in relation to papal elections. For his services in this he was rewarded with the archbishopric of Ravenna, to which he was consecrated in 1073. By thirty bishops of the imperialist party he was elected pope at Brixen in 1080, an election which was confirmed by the synod which Henry had convened in Rome in 1084, Guibert assuming the title of Clement III. Although it was from his hands that Henry received his coronation, Clement III. met with scant recognition from the clergy, and exercised few papal functions; and his name is not enrolled in any list of popes. He died in September, 1100, and was buried at Ravenna; by the order of Paschal II. his ashes were afterward disinterred and scattered to the winds.

GUICCIARDINI, FRANCESCO, Italian historian and statesman, was born at Florence in the year 1483. His family was illustrious and noble; and his ancestors for many generations had held the highest posts of

honor in the state. After the usual education of a boy in grammar and elementary classical studies, his father sent him to the universities of Ferrara and Padua, where he stayed until the year 1505. Guicciardini, whose motives were confessedly ambitious, turned his attention to law, and at the age of twenty-three was appointed by the signoria of Florence to read the institutes in public. He was then practicing at the bar, where he won so much distinction that the signoria in 1512 intrusted him with an embassy to the court of Ferdinand the Catholic. In 1515 Leo X. took him into service, and made him governor of Reggio and Modena. In 1521 Parma was added to his rule, and in 1523 he was appointed viceregent of Romagna by Clement VII. These high offices rendered Guicciardini the virtual master of the papal states beyond the Apennines, during a period of great bewilderment and difficulty. In 1526 Clement gave him still higher rank as lieutenant-general of the papal army. While holding this commission, he had the humiliation of witnessing from a distance the sack of Rome and the imprisonment of Clement, without being able to rouse the perfidious duke of Urbino into activity. Clement did not, however, withdraw his confidence, and in 1531 Guicciardini was advanced to the governorship of Bologna, the most important of all the papal lord-lieutenancies. This post he resigned in 1534 on the election of Paul III., preferring to follow the fortunes of the Medicean princes. In 1527 he had been declared a rebel by the signoria on account of his well-known Medicean prejudices; and in 1530, deputed by Clement to punish the citizens after their revolt, he revenged himself with a cruelty and an avarice that were long and bitterly remembered. When, therefore, he returned to inhabit Florence in 1534, he did so as the creature of the dissolute Alessandro de' Medici. Guicciardini pushed his servility so far as to defend this infamous despot at Naples in 1535, before the bar of Charles V., from the accusations brought against him by the Florentine exiles. He won his cause; but in the eyes of all posterity he justified the reproaches of his contemporaries, who describe him as a cruel, venal, grasping seeker after power, eager to support a despotism for the sake of honors, offices and emoluments secured for himself by a bargain with the oppressors of his country. Varchi, Pitti, Segni and Nardi are unanimous upon this point. After the murder of Duke Alessandro in 1537, Guicciardini espoused the cause of Cosimo de' Medici, a boy addicted to field sports, and unused to the game of statecraft. The wily old diplomatist hoped to rule Florence as grand vizier under this inexperienced princeling. He was mistaken, however, in his schemes, for Cosimo displayed the genius of his family for politics, and coldly dismissed his would-be lord-protector. Guicciardini retired in disgrace to his villa, where he spent his last years in the composition of the *Istoria d' Italia*. He died in 1540 without male heirs.

GUIDI, CARLO ALESSANDRO, Italian lyric poet, was born at Pavia in 1650. As chief founder of the well-known Roman Academy called "L'Arcadia," he had a considerable share in the reform of Italian poetry, corrupted at that time by the extravagance and bad taste of the poets Marini and Achillini and their school. His most celebrated song is that entitled *Alla Fortuna* (To Fortune), which certainly is one of the most beautiful pieces of poetry of the seventeenth century. His poems were printed at Parma in 1671, and at Rome in 1704. In 1681 he published at Parma his lyric tragedy *Amalanto in Italy*, and two pastoral dramas *Daphne* and *Endymion*. Less fortunate was Guidi's poetical version of the six homilies of Pope Clement XI., first as

having been severely criticised by the satirist Settano, and next as having proved to be the indirect cause of the author's death. A splendid edition of this version had been printed in 1712, and, the pope being then in San Gandolfo, Guidi went there to present him with a copy. On the way he found out a serious typographical error, which he took so much to heart that he was seized with an apoplectic fit at Frascati and died on the spot.

GUIDICCIONI, GIOVANNI, one of the best Italian poets of the first half of the sixteenth century, was born at Lucca in 1480, and died at Macerata in 1541. He occupied a high position, being bishop of Fossombrone and president of Romagna.

GUIDO OF AREZZO, an Italian monk of the eleventh century, has by many been called the father of modern music, and a portrait of him in the refectory of the monastery of Avellana bears the inscription "Beatus Guido, inventor musicæ." Occasional reference to the celebrated musician in the works of his contemporaries are, however, by no means rare, and from these it may be conjectured with all but absolute certainty that Guido was born in the last decade of the tenth century. The place of his birth is, beyond a doubt, Arezzo; for on the title-page of all his works he is styled *Guido Aretinus*, or simply *Aretinus*. At his first appearance in history Guido was a monk in the Benedictine monastery of Pomposa, and it was there that he invented his educational method, by means of which, according to his own statement, a pupil might learn within five months what formerly it would have taken him ten years to acquire. Certain it is that not long after his flight from Pomposa Guido was living at Arezzo, and it was here that, about 1030, he received an invitation to Rome from Pope John XIX. He obeyed the summons, and the pope himself became his first and apparently one of his most proficient pupils. But in spite of his success Guido could not be induced to remain in Rome, the insalubrious air of which seems to have affected his health. In Rome he met again his former superior, the abbot of Pomposa, who seems to have repented of his conduct toward Guido, and to have induced him to return to Pomposa; and here all authentic records of Guido's life cease. We only know that he died on May 17, 1050, as prior of Avellana, a monastery of the Camaldulians. It was he who invented, or at least for the first time systematically used, the lines of the staff, and the intervals or *spatia* between them, and thus fixed the principle of modern notation; and the value of this innovation for educational and general artistic purposes cannot be overrated. There is also little doubt that the names of the first six notes of the scale, *ut, re, mi, fa, sol, la*, still in use among Romance nations, were introduced by Guido, although he seems to have used them in a relative rather than in an absolute sense. It is well known that these words are the first syllables of six lines of a hymn addressed to St. John the Baptist, which may be given here:

<i>Ut</i> queant laxis	<i>resonare fibris</i>
<i>Mira</i> gestorum	<i>famuli tuorum,</i>
<i>Solve</i> polluti	<i>labii reatum,</i>
Sancte Joannes.	

GUIDO RENI, painter, born in 1575; died in 1642. See RENI, page 5025.

GUIDO OF SIENA. The name of this painter is of considerable interest in the history of art, on the ground that, if certain assumptions regarding him could be accepted as true, he would be entitled to share with Cimabue, or rather indeed to supersede him in the honor of having given the first onward impulse to the art of painting. The case stands thus: In the church of S. Domenico in Siena is a large painting of the *Vin*

gin and Child enthroned, with six angels above, and in the Benedictine convent of the same city is a triangular pinnacle, once a portion of the same composition, representing the Saviour in benediction, with two angels; the entire work was originally a triptych, but is not so now. The principal section of this picture has a rhymed Latin inscription, giving the painter's name as Gu . . . o de Senis, with the date of 1221: the genuineness of the inscription is not, however, free from doubt. The heads of the *Virgin and Child* are indisputably very superior, in natural character and graceful dignity, to anything to be found anterior to Cimabue. The question therefore arises: Are these heads really the work of a man who painted in 1221. The best informed connoisseurship of recent years pronounces in the negative, concluding that the heads are repainted, and are, as they now stand, due to some artist of the fourteenth century, perhaps Ugolino da Siena; thus the claims of Cimabue would remain undisturbed and in their pristine vigor. Beyond this, little is known of Guido de Siena.

GUIENNE, an old French province, whose name until the tenth century was Aquitania, and whose history until it came into the possession of England in 1152 is given under the heading AQUITANIA. It was bounded by the Pyrenees, Languedoc, Auvergne, Angoumois, Saintonge, and the sea of Gascony; and out of it are now formed the departments of Gironde, Dordogne, Lot, Aveyron, Lot-et-Garonne, Tarn, Landes, Gers, Upper Pyrenees, Ariège, and Lower Pyrenees. The chief town was Bordeaux.

GUIGNES, JOSEPH DE, a French Orientalist, born at Pontoise October 19, 1721, became in his fifteenth year a student of Oriental languages, and especially of Chinese, at the Collège Royal under the celebrated Fourmont, whom in 1745 he succeeded at the Royal Library as secretary interpreter of the Eastern languages. A *Mémoire Historique sur l'Origine des Huns et des Turcs*, published by De Guignes in 1748, having brought his name with some prominence before the learned world, he was admitted a member of the Royal Society of London in 1752 and an associate of the French Academy of Inscriptions in 1754. Two years later he gave to the world the first two volumes of his learned and laborious *Histoire Générale des Huns, des Mongoles, des Turcs, et des autres Tartares occidentaux*; and in 1757 he was appointed to succeed Jault in the chair of Syriac at the Collège Royal. The completion of the *Histoire* by the publication of the three remaining volumes in 1758 was followed in 1759 by the publication of a *Mémoire* in which he propounded and endeavored to prove the untenable and absurd theory that the Chinese nation had originated in Egyptian colonization, an opinion to which, in spite of every argument, he to the last obstinately clung. He died at Paris, March 19, 1800.

GUILD. The spirit of association has in all ages induced men to join together for the pleasures of mutual enjoyment or for the attainment of some common purpose for which the support of members was necessary. The idea has taken shape in various ways, influenced by the temperament of race, the policy of governments, the social condition of classes, or the need for a special object. Independently of the organization of peoples, of their constitutions into towns, provinces, and states as units in a system, whether of self-government or of imposed government—independently too of those great associations or brotherhoods, the church, the orders of knighthood, the greater and lesser monastic orders and secret societies—there is a third kind of association upon a basis distinct from these. The public welfare of a community within certain territorial limits is the great object of Govern-

ments, local or imperial; the pursuit of some great moral, religious, or equitable thought, touching the hearts of men in general without regard to nation, was the animating principle of the chivalric and religious orders; but when men began to form themselves into *guilds*, the benefit of each one in his individual and social capacity was concerned, naturally confined within the bounds of neighborhood. A guild was a voluntary association of those living near together who joined for a common purpose, paying contributions, worshipping together, feasting together periodically, helping one another in sickness and poverty, and frequently united for the pursuit of a special object.

The true history of these institutions has been till recently unnoticed, their value and importance, especially in connection with the life of towns and villages, having been but imperfectly investigated or understood. Guilds have, however, been numerous, and their influence most important, in Europe from an early period; they attained their highest prosperity and development in the Teutonic countries, and especially in England during the Middle Ages, and they have been widely spread among the Romance nations.

The essential principle of the guild is the banding together for mutual help, mutual enjoyment, and mutual encouragement in good endeavor. The spirit which directed itself to the inner business and life of each society and its members is the true mark, in some degree, of all bodies, ancient or modern, that can claim the character of guilds. The peace-guild of the north in the tenth century had this character in common with the great trading guild of the thirteenth and fourteenth centuries, or the little social or religious guild of an English country village a century later.

Some German scholars find the origin of the first guilds in the banquets and sacrificial assemblies of the heathen German tribes.

The Romans exercised the right of association from early times; it is attributed to Numa that he encouraged the formation of craft guilds, of which Plutarch enumerates nine; there also existed early religious societies among them. Exercised voluntarily under the republic, this right became crippled under the empire, and the *collegia* were obliged to seek authorization from the state for the narrower objects to which the imperial decrees attempted to limit them. These societies were numerous, not only at Rome, but throughout the empire, especially in the East, in Italy, and in Gaul; a large number were trade corporations, devoted to the interest of their crafts; others were united for good-fellowship, religion, and many especially to provide for burial. In the provinces, besides merchants and others, the highest persons were glad at times to belong to them; those in Rome under the empire appear to have consisted principally of workmen, freedmen, slaves and persons of the humbler classes. All appear to have had the same general features; they chose their own masters and officers, made rules for self-government, paid contributions to a common fund, met and feasted together at stated periods—the freedom of social intercourse being particularly appreciated among the poorer companies. They formed rules for good behavior at table, and admitted women as members; they "affirmed their existence by a common worship," choosing a patron god.

The Greeks also, in the second and third centuries B.C., had their associations of the same kind, called *Eranoi* or *Thiasoi*, which were numerous at Rhodes, in the islands of the Archipelago, at the Piræus, and in other important places. These societies partook more nearly of the character of the mediæval guilds than did the Roman: the members paid contributions to a gen-

eral fund, aided one another in necessity, provided for funerals, met in assembly to deliberate on their affairs, and celebrated feasts and religious sacrifices in common. Strict rules against disorderly conduct were to be enforced by fine; he who did not pay his yearly quota to the society was excluded, unless he could show good cause of poverty and sickness. Women could be members, and were admitted to the meetings. Some of these societies concerned themselves with religion, others with politics or commerce; in the cause of liberal as opposed to official religion, they appear to have done good service.

In the Middle Ages guilds are recognized as belonging to three of four classes. In the north of Europe the *frith* or *peace-guild* was an important form, widely spread in early times. These were associations for defense, based upon mutual obligations, "sworn communities for the protection of right and the preservation of liberty;" we see traces of them in England from the laws of Ina (seventh century) down to the "Dooms" of London in Athelstan's time (tenth century).

The early English recognized the responsibility of the guild for the actions of its members and their mutual liability,—the fundamental principle of English institutions for keeping the peace; besides this, the rules still exist of Saxon guilds at Abbotsbury, Woodbury, Cambridge, and Exeter, and show by the many points in common with the social guilds of later English growth whence these derived their descent.

At the time of the reformation these guilds were abolished in Protestant countries, under pretense of their being superstitious foundations; in Denmark and North Germany their property was devoted to public service, but in England it was handed over to the king and his courtiers, their guild-halls became poor-houses, their pageants were laid aside. A very few of these societies escaped; St. George's guild at Norwich continued to live on many years.

Wickliffe, in the fourteenth century, had complained of the abuses among the guilds, including those of trades. In 1389 returns were made into chancery of the social and other guilds in England; these, though imperfect, give a valuable body of details, and draw the distinction between the two great classes of social and trade guilds. The trade guilds have in all countries attracted more attention than the rest, on account of their wealth and importance; they are of two orders, *guilds-merchant* and *craft-guilds*. In great cities, such as London and Florence, we do not hear of merchant guilds (Norton); there the separate occupations or crafts early asserted their associating power and independence, and the craft-guilds gradually took a place in the organization of the town government. Many craft-guilds, the heads of which were concerned in the government of the commune, are found in Italy between the ninth and twelfth centuries. But in England and the north of Europe the guilds-merchant during this period, having grown rich and tyrannical, excluded the landless men of the handicrafts; these then uniting among themselves, there arose everywhere by the side of the guilds-merchant the craft-guilds, which gained the upper hand on the continent in the struggle for liberty in the thirteenth and fourteenth centuries. In England these companies usually existed side by side with the old town or merchant-guild; until at length their increasing importance caused the decay of the old guilds, and the adoption of these crafts as part of the constitution of the towns (thirteenth to fifteenth century).

The constitution of the trade-guilds was formed on the model of other guilds; they appointed a master or alderman and other officers, made ordinances, including provisions for religious observance, mutual help and

burial; the town ordinances yet remaining of many places, as of Berwick, Southampton and Worcester, show traces of the trade laws of the old guilds-merchant.

GUILFORD COURT HOUSE, a hamlet in North Carolina, the scene of a battle between Gen. Nathanael Greene (*q.v.*) and Lord Cornwallis, (*q.v.*)

GUILDFORD, a municipal and parliamentary borough and market-town of England, capital of the county of Surrey, is beautifully situated on a gentle acclivity of the northern chalk downs and on the river Wye, crossed there by a bridge of five arches, thirty miles south-southwest of London. Population about 12,000.

GUILLEMOT, the name accepted by nearly all modern authors for a Sea-bird, known as the Frowl, which in former days yearly frequented the cliffs on many parts of the British coasts in countless multitudes. The common Guillemot of both sides of the Atlantic is replaced further northward by a species with a stouter bill, the *U. arra* or *U. bruennichi* of ornithologists, and on the west coast of North America by the *U. californica*. The habits of all these are essentially the same, and the structural resemblance between all of them and the Auks is so great that of late several systematists have relegated them to the genus *Alca*.

GUILLOTINE, the instrument for inflicting capital punishment by decapitation, introduced into France at the period of the Revolution. It consists of two upright posts surmounted by a cross-beam, and grooved so as to guide an oblique-edged knife, the back of which is heavily weighted to make it fall swiftly and with force when the cord by which it is held aloft is let go. Some ascribe the invention of the machine to the Persians; and previous to the period when it obtained notoriety under its present name it had been in use in Scotland, England, and various parts of the Continent. There is still preserved in the Antiquarian Museum of Edinburgh the rude guillotine called "the maiden," by which the Regent Morton was decapitated in 1581. The last persons decapitated by the Scotch "maiden" were the Marquis of Argyll in 1661, and his son the Earl of Argyll in 1685. It would appear that no similar machine was ever in general use in England; but until 1650 there existed in the forest of Hardwick, which was coextensive with the parish of Halifax, West Riding, Yorkshire, a mode of trial and execution called the gibbet law, by which a felon convicted of theft within the liberty was sentenced to be decapitated by a machine called the Halifax gibbet. In Germany the machine was in general use during the Middle Ages, under the name of the *Diele*, the *Hobel*, or the *Dolabra*. From the thirteenth century it was used in Italy under the name of *Mannaia*, for the execution of criminals of noble birth. The *Chronique de Jean d'Anton*, first published in 1835, gives minute details of an execution in which it was employed at Genoa in 1507; and it is elaborately described by Père Labat in his *Voyage en Espagne et en Italie* in 1730. It is mentioned by Puy-ségur in his *Mémoires* as in use in the south of France, and he describes the execution by it of Marshal Montmorency at Toulouse in 1632. For about a century it had, however, fallen into general disuse on the Continent; and Doctor Guillotin, who first suggested its use in modern times, is said to have obtained his information regarding it from the description of an execution that took place at Milan in 1702.

Guillotin, who was born at Saintes, May 28, 1738, and elected to the Constituent Assembly in 1789, brought forward on December 1st, of that year, two propositions regarding capital punishment, the second of which was that, "in all cases of capital punishment it shall be of the same kind—that is decapitation—and

k shall be executed by means of a machine." The reasons urged in support of this proposition were that in cases of capital punishment the privilege of execution by decapitation should no longer be confined to the nobles, and that it was desirous to render the process of execution as swift and painless as possible. The debate was brought to a sudden termination in peals of laughter caused by an indiscreet reference of Dr. Guillotin to his machine, but his ideas seem gradually to have leavened the minds of the assembly, and after various debates decapitation was adopted as the method of execution in the penal code which became law on October 6, 1791. At first it was intended that decapitation should be by the sword, but on account of a memorandum by M. Sanson, the executioner, pointing out the expense and certain other inconveniences attending that method, the assembly referred the question to a committee, at whose request Dr. Antoine Louis, secretary to the academy of surgeons, prepared a memorandum on the subject. Without mentioning the name of Guillotin, it recommended the adoption of an instrument similar to that which was formerly suggested by him. The assembly decided in favor of the report, and the contract was offered to the person who usually provided the instruments of justice; but, as his terms were considered exorbitant, an agreement was ultimately come to with a German of the name of Schmidt, who, under the direction of M. Louis, furnished a machine for each of the French departments. After satisfactory experiments had been made with the machine on several dead bodies in the hospital of Bicêtre, it was erected on the Place de Grève for the execution of the highwayman Pelletier on April 25, 1792. While the experiments regarding the machine were carried on, it received the name *Louisette* or *La Petite Louison*, but the mind of the nation seems soon to have reverted to Guillotin, who first suggested its use; and in the *Journal des Révolutions de Paris* for April 28, 1792, it is mentioned as *la guillotine*, a name which it thenceforth bore both popularly and officially. In 1795 the question was much debated as to whether or not death by the guillotine was instantaneous, and in support of the negative side the case of Charlotte Corday was adduced, whose countenance, it is said, blushed as if with indignation when the executioner, holding up the head to the public gaze, struck it with his fist. The connection of the instrument with the horrors of the Revolution has hindered its introduction into other countries, but in 1853 it was adopted under the name of *Fallschwert* or *Falbeil* by the kingdom of Saxony, and it has been subsequently introduced into several other German states. It has often been stated that Dr. Guillotin perished by the instrument which bears his name, but it is beyond question that he survived the Revolution, and died a natural death in 1814.

GUIMARAES, a fortified city of Portugal, province of Minho, government district of Braga, is beautifully situated on the Ave, twelve miles southeast of Braga. Population about 10,000.

GUINEA, the general name applied by Europeans to part of the western coast region of intertropical Africa. Like many other geographical designations, the use of which is controlled neither by natural nor political boundaries, it has been very differently employed by different writers and at different periods. In the widest acceptance of the term, the Guinea coast may be said to extend from 11° north latitude to 16° south latitude, or, in other words, from the neighborhood of Cape Verga to Cape Negro. Southern or Lower Guinea comprises the coasts of Loango, Congo, Angola, and Benguela; and Northern or Upper Guinea comprises part of Senegambia, the Sierra Leone dis-

trict, the Grain Coast, the Ivory Coast, the Gold Coast, the Slave Coast, the Niger Delta, and the Calabar district. The Cameroon mountains may be accepted as the limit of the two divisions, though some writers prefer the river Gambia or the equator. In a narrower and perhaps more common use of the name, Guinea is the coast only from Cape Palmas to the Gaboon.

GUINEA FOWL, a well-known domestic gallinaceous bird, so called from the country whence in modern times it was brought to Europe, the *Meleagris* and *Avis* or *Gallina Numidica* of ancient authors. Little is positively known of the wild stock to which we owe our tame birds, nor can the period of its reintroduction (for there is apparently no evidence of its domestication being continuous from the time of the Romans) be assigned more than roughly to that of the African discoveries of the Portuguese.

GUINEA GRASS (*Panicum maximum*), a grass of the same genus with millet, a native of the West of Africa, but now naturalized, and cultivated in the West Indies and Southern States. Its height in favorable moist situations is from five to ten feet; in dry grounds it is smaller; it has a much-branched and spreading panicle, long flat leaves, and a somewhat creeping root.

GUINEA PEPPER, a name applied to the seeds or dried fruit of several different plants, agreeing in their peppery character, and in being the produce of the West of Africa. The name Malaguetta (Malagheta, Meleguetta, etc.) pepper is generally regarded as equivalent with Guinea pepper, and is a frequent designation of grains of Paradise; but the capsules or dry berries of *Capsicum frutescens* are commonly sold by druggists under the name of Guinea pepper; while both the names Guinea Pepper and Malaguetta pepper have been applied to the dried fruit of *Cubeba clusii*, and to the seeds of *Habzelia* (or *Xylopia*) *athiopica*, a shrub of the natural order Anonaceae.

GUINEA-PIG. See CAVY.

GUINEA-WORM, known also as *Filaria medienensis*, or *F. dracuncululus*, a parasitic animal, the body of which is slender, cylindrical, and compressed, and is of the thickness of pack-thread, except at the posterior extremity, where it is somewhat attenuated. It is opaque, of milk-white color; on each side there is a longitudinal line. The length of the worm varies from less than half a foot to three yards. The young animals enter the cuticle and there undergo development, the period of development ranging from two to twenty-four months. They give rise to exceedingly unpleasant and sometimes fatal consequences—particularly if, in their extraction, they are broken. They are thought by some authors to be the fiery serpents which afflicted the Jews in the wilderness.

GUINGAMP, a town of France, capital of an arrondissement in the department of Côtes-du-Nord, is situated in a large and rich valley on the right bank of the Trieux, twenty miles west-northwest of St. Brieuc. Population about 8,000.

GUIPUZCOA, the smallest and most densely populated of the three Basque provinces of Spain, is bounded on the north by the Bay of Biscay, on the west by the province of Biscay, on the south and southeast by Alava and Navarre, and on the northeast by the Bidasoa, which separates it from France. Its area is nearly 728 square miles, and its estimated population is 200,000. Situated on the northern slope of the great Cantabrian chain, the province has a great variety of surface in mountain, hill, and valley; and the scenery accordingly is highly picturesque and romantic. The capital of the province is San Sebastian, with a population of 21,355. All the other towns are small, Tolosa alone having a population at all exceeding 5,000; Fuenterrabia no

longer retains its former importance; Mondragon is entirely dependent on the rich iron mines in its vicinity, and Salinas, on the Deva, on its salt works. A small island in the Bidasoa, called *La Isla de los Paisanes*, or *Pisle de la Conférence*, is celebrated as the place where the marriage of the duke of Guienne was arranged between Louis XI. and Henry IV. in 1463, where Francis I. the prisoner of Charles V. was exchanged for his two sons in 1526, and where in 1659 "the peace of the Pyrenees" was concluded between D. Luis de Haro and Cardinal Mazarin.

GUISBOROUGH, or **GISBOROUGH**, a market town of England, North Riding of Yorkshire, is situated in a narrow but fertile valley at the foot of the Cleveland Hills, four miles from the mouth of the Tees and ten miles east-southeast of Middlesborough. Population about 8,000.

GUISCARD. See **ROBERT GUISCARD**.

GUISE, a fortified town of France, department of the Aisne, arrondissement of Vervins, is situated on the left bank of the Oise, thirteen miles northwest of Vervins. Population, 6,500.

GUISE, HOUSE OF. The House of Guise, which in the sixteenth century suddenly rose to an eminence unrivaled in Europe, takes title from the place noticed above. The countyship of Guise, a fief under the French crown, was carried in 1333 by its holder, Marie of Blois, as her dower to Rodolf, duke of Lorraine. In 1508 René II., the conqueror of Charles the Bold, divided his territories between his sons Antony, who became duke of Lorraine, and received the Germanic part, and Claude, who had the French fief, including Guise.

Claude of Lorraine thus became founder of a great and well-marked family, which occupied the place that had in the fifteenth century been held by the princes of the Lilies. Generation after generation we have a duke and a cardinal side by side: they illustrate with singular fidelity the movements of the period from its Catholic side: the first duke and cardinal belonged to the Renaissance; the second pair threw themselves into the Catholic reaction, and led the resistance to the Reformation in France; the third pair shows the decay of the religious movement, and its transit into political activities, being among the most ambitious statesmen of the later years of the century; while the fourth and last pair feel the breath of Richelieu's absolutism. Claude of Lorraine, born in 1496, succeeded in 1508 to a group of lordships, which by their names testify to the high fortunes of the house. The shield of Claude expresses the pride of the race: we find there not only the Lorraine spread-eagle, the German bird, but also the quarterings of eight sovereign houses, those of the kings of Hungary, Naples, Jerusalem, and Aragon, and of the sovereign lords of Anjou, Guelderland, Flanders, and Bar. This young prince, who claimed so much, and did so much, who both exercised his rights as a foreign prince and took precedence of the proudest in France, attached himself closely to Francis I. He was the most brilliant among the "young men" who displaced the older wisdom of the court of Louis XII. In 1513 he married Antoinette of Bourbon, the duke of Vendôme's daughter and great-aunt of Henry IV.; in 1515 he accompanied Francis to Italy; in 1521 he was on the Spanish frontier, and helped to take Fuenterrabia; in 1522 he opposed the English in the north, covering Paris; next, he defended Champagne from the Germans; and during the captivity of Francis I. at Madrid, he became virtual head of the regency under the queen, Louise of Savoy. In these dark days he crushed the rising of the peasants of Lorraine and Swabia, which threatened all the east of France. After the king's return, Claude was made (in

1527) duke of Guise, and peer, and governor of Champagne. Claude had twelve children, a splendid group of princely youth, who inherited the handsome features and figure of their father, with even greater abilities and a more effective ambition. Francis, the eldest of those who grew up, was born in 1519, and became the second duke; Charles, born in 1524, was the second cardinal of Lorraine, a man as intelligent and depraved as his uncle, and more vigorous and ambitious; Claude, the next, was created duke of Aumale; Louis, archbishop of Sens and cardinal of Guise; René, marquis of Elbeuf. The daughters made brilliant matches: above all, the eldest, Marie, widow of the duke of Longueville, was married in 1538 to James V. of Scotland, and had a stormy career as regent to her daughter, Mary Stuart, queen of Scots.

Claude of Guise died in 1550, leaving his dignities to his son Francis "le grand Guise," who had already won great credit for bravery, and had shown that dashing contempt for all rules of military prudence which gives a captain undying popularity. In 1552, as lieutenant-general in the three bishoprics, he withstood at the siege of Metz the last efforts of Charles V., and saved France from a terrible invasion. Thanks to the jealousy of the Montmorencys, he was sent in 1557 to conquer Naples, and would have added another to the long roll of reputations ruined by Italy, had he not been suddenly recalled to protect his country after the disaster of St. Quentin. With happy boldness, instead of watching the victorious allies, he suddenly attacked and took Calais, ending the English occupation of French soil, and raising his own renown to the highest point. Then, with his brother Charles, second cardinal of Lorraine, he wielded unlimited power throughout the reign of Francis II. Under Charles IX. his influence abated and he withdrew into Alsace. On his return thence in 1562, he was, however unwillingly, for he was not inhumane, the cause of the massacre of Vassy, which began the civil wars. In the first war he won the battle of Dreux (1562), and thence passing southward besieged the Huguenots in Orleans. There, early in 1563, he was assassinated. If he was the noblest of the Guises, his brother Charles, second cardinal of Lorraine was the ablest. In his earlier days the cardinal had shown some sympathy with the Reformers; in later life he vigorously repressed them, and took a leading part in the council of Trent, where he is said to have sketched the first lines of the famous league. Like all early friends of the Jesuits, he did his best for education, and patronized men of letters, while he coerced independence of thought and aimed at introducing the Inquisition. He died in 1574. His younger brother Louis, first cardinal of Guise, "le cardinal des bouteilles," was a grand pluralist, an easy-going personage, whose quiet life was in striking contrast to the feverish energy of his brothers. René, marquis of Elbeuf, another brother, is the stem of the great houses of Elbeuf, Harcourt, and Lislebonne.

Henry of Guise, eldest son of Duke Francis, born in 1550, was with his father at Orleans, and saw his death. The boy therefore began his public life with an inextinguishable hatred against Huguenots, eager to distinguish himself in civil war. With his brother Louis, second cardinal of Guise, he entered into all the intrigues of the succession question, and bitterly opposed Henry of Navarre. He was at Jarnac, and, in the victory of Dormans (1575) over the German invaders, he too won the title of "le Balafre." He soon became the idol of Paris: namely, handsome, and decided, he won all the hearts, and was at once a popular hero. Fortune too favored him by bringing him into contrast with the wretched Henry III., and with his brother the duke of Mayenne. In 1576 he was recognized as head

of the League, supported by Philip II. and the papacy. Ambitious of the crown of France, he worked subtly for it behind the screen of old Cardinal Bourbon's name. In the war of the three Henries (Henry III., Henry of Navarre, Henry of Guise) he again drove the Germans out of France; and, when invited to the capital by the "Sixteen," ruled there unopposed, the "King of Paris." Henry III., whom he had compelled to sign the Edict of Union, found his supremacy intolerable; and just before Christmas (1588), the duke and the cardinal, his brother, were assassinated by the royal orders.

His eldest son, Charles, born in 1571, was arrested at the time of the double murder, but escaped in 1591, and was welcomed with enthusiasm by the Paris mob, which hoped he would wed the infanta of Spain, and with the help of Philip II. secure for himself the throne of France. But the opposition of his uncle Mayenne proved fatal to the scheme. At the end of the struggle, both he and Mayenne submitted to Henry IV., helped him to reduce the nobles in Languedoc, and received the Government of Provence. In Richelieu's days he sided with the queen mother, and was compelled to withdraw in 1631 to Italy, where he died in 1640. By his side also was a cardinal brother, the third of Guise, who ended by abandoning the ecclesiastical state, and marrying one of the mistresses of Henry IV.

Henry, fourth son of Charles, born in 1614, had already succeeded to that family benefice, the archbishopric of Rheims, when the death of his elder brother made him head of the family, and in 1640 fifth duke. He, too, went against the absolutism of the age, and joined the count of Soissons. Condemned to lose his head he fled to Brussels, and took command of the Austrian troops against France—noble traitors to their country being then not uncommon. In 1643, however, after Richelieu's death, he returned to France; but, being chosen their chief by the Neapolitans, at the time of Masaniello's revolt, and dazzled by this opening for his ambition, he betook himself to Naples. There his failure was complete; he was defeated and carried prisoner to Madrid. Delivered thence by the intercession of the Great Condé, he again attempted Naples, and failed again. After this he spent the rest of his romantic, ill-ordered life at the French court, and died in 1664, leaving no issue; his sisters never married, and of all his brothers, one only, Louis, duke of Joyeuse, left a son, born in 1650, who became sixth duke of Guise. He died of small-pox in 1671, leaving an infant son, Francis Joseph, seventh duke, a sickly babe, with whom, four years later, the direct line of the house of Guise expired. The other branches had early died out, saving the family of the seventh son of Claude, first duke, Rene, marquis of Elbeuf; the marquis of Lambesc, who died in 1826, was the last descendant of this branch, and with him the family finally became extinct.

GUIAR, a stringed instrument of Eastern origin. The name no doubt is derived from the Greek, but the instrument itself we owe to the Arabs, who introduced it into Spain. In the sixteenth century it became known in Italy and France, and about 1790 a German instrument maker of the name of Cetto greatly increased its power by adding a sixth string to the five formerly in use. The genuine Spanish guitar was introduced into England after the Peninsula war by Ferdinand Sor, a Spaniard, who was both a composer for and a player on the instrument. About the same time the guitar was very much in fashion on the Continent, and even Paganini cultivated it. But this circumstance was due to the romantic associations rather than to the intrinsic merits of the instrument, and accordingly it soon relapsed into comparative oblivion. It is, however, occasionally em-

ployed in the orchestra and for the accompaniment of simple vocal pieces, and for these purposes it has no doubt its merits. The guitar is a flat-blacked instrument, the sides of which turn inward. The sounding-board, pierced by a round sound-hole, is generally made of pine, maple or cherry wood being used for the sides and the back. The modern guitar, as already stated, has six strings, while the original *El Aud* of the Arabs had only four, subsequently increased to five.

GUIZOT, FRANÇOIS PIERRE GUILLAUME, historian, orator and statesman, was born at Nîmes on October 4, 1787, of an honorable Protestant family belonging to the *bourgeoisie* of that city. The liberal opinions of his family did not save it from the sanguinary intolerance of the Reign of Terror; and on April 8, 1794, his father perished at Nîmes upon the scaffold. Thenceforth the education of the future minister devolved upon his mother, a woman of slight appearance and of homely manners, but endowed with great strength of character and clearness of judgment. Madame Guizot was a living type of the French Huguenots of the sixteenth century, stern in her principles and her faith, immovable in her convictions and in her sense of duty. In the days of his power, her simple figure, always clad in deep mourning for her martyred husband, was not absent from the splendid circle of his political friends. In the days of his exile in 1848 she followed him to London, and there at a very advanced age closed her life, and was buried at Kensal Green. Driven from Nîmes by the Revolution, Madame Guizot and her son repaired to Geneva, where he received his education. She was a strong liberal, and she even adopted the notion, inculcated in the *Émile*, that every man ought to learn a manual trade or craft. Young Guizot was taught to be a carpenter. Of the progress of his graver studies little is known, for in the work which he entitled *Memoirs of My Own Times*, Guizot omitted all personal details of his earlier life. But his literary attainments must have been precocious and considerable, for when he arrived in Paris in 1805, to pursue his studies in the faculty of laws, he entered, at eighteen, as tutor into the family of M. Stapfer, formerly Swiss minister in France, and he soon began to write in a journal edited by Suard, the *Publiciste*. This connection introduced him to the literary society of Paris. In October, 1809, being then twenty-two, he wrote a review of M. de Chateaubriand's *Martyrs*.

During this period of his life Guizot, entirely devoted to literary pursuits, published a collection of French synonyms (1809), an essay on the fine arts (1811), and a translation of Gibbon with additional notes in 1812. On political subjects a radical antagonism existed between the young constitutional publicist and the spirit of the empire. This did not prevent M. de Fontanes from selecting Guizot for the chair of modern history in Paris in 1812. His first lecture (which is reprinted in his *Memoirs*) was delivered on December 11th of that year. The customary compliment to the all-powerful emperor, he declined to insert in it, in spite of all hints given him by his patrons. Absent from Paris at the moment of the fall of Napoleon in 1814, he was at once selected, on the recommendation of Royer-Collard, to serve the Government of Louis XVIII. in the capacity of secretary-general of the ministry of the interior, under the Abbé de Montesquieu. Upon the return of Napoleon from Elba he immediately resigned, on March 25, 1815 (the statement that he retained office under General Carnot is incorrect), and returned to his literary pursuits. The liberal professions of the emperor during the Hundred Days, though backed by Benjamin Constant, did not for a moment impose on Guizot. He was convinced that Napoleon would never govern as

liberal principles, and that his power could not last. He was equally convinced that a second restoration of the Bourbons was the only mode by which constitutional monarchy could be established in France. He therefore applied himself to promote that object, and repaired to Ghent, where he saw Louis XVIII., and in the name of the liberal party pointed out to his majesty that a frank adoption of a liberal policy could alone secure the duration of the restored monarchy—advice which was ill-received by M. de Blacas and the king's confidential advisers. This visit to Ghent, at a time when France was a prey to a second invasion, was made a subject of bitter reproach to Guizot in after life by his political opponents, as an unpatriotic action. "The Man of Ghent" was one of the terms of insult frequently hurled against him in the days of his power.

On the second restoration Guizot resumed office as secretary-general of the ministry of justice under M. de Marbois, but this minister resigned in 1816, and the young statesman was promoted to the council of state and to the general directorship of the departmental and communal administration of the kingdom. But the reactionary spirit of the chamber of deputies, of the royalist party, and of the successive governments of Louis XVIII., was extremely opposed to the views of Guizot and his friends.

In the eyes of this celebrated party known as the Doctrinaires, the French Revolution had run its course. It had exhausted the popular excesses of the convention and the military despotism of the empire. The victory of the revolution over the arbitrary powers of the crown and the unjust privileges of the aristocracy was complete. Power was transferred to the middle classes of society, and their leaders hoped to establish on the basis of a limited suffrage all the essential rights and liberties of a free people. Their policy was described by the term "juste milieu"—a *via media* between royal authority and popular government. In 1821, when the reaction was at its height after the murder of the Duc de Berri, and the fall of the ministry of Duc Decazes, Guizot's relations to the Government of M. de Villèle became decidedly hostile. He was deprived of all his offices, and in 1825, even his course of lectures was interdicted. During the five succeeding years he played an important part among the leaders of the liberal opposition to the Government of Charles X., although he had not yet entered parliament, and this was also the time of his greatest literary activity. Within this period he published his lectures on representative government; a work on capital punishment for political offenses; a collection of memoirs of the history of England in twenty-six volumes, and of memoirs of the history of France in thirty-one volumes; and a revised translation of Shakespeare. The most remarkable work from his own pen was the first part of his *History of the English Revolution from the Accession of Charles I. to that of Charles II.* The Martignac administration restored Guizot in 1828 to his professor's chair and to the council of state. Then it was that he delivered the celebrated courses of lectures which raised his reputation as an historian to the highest point of fame, and placed him among the best writers of France and of Europe. These lectures formed the basis of his general *History of Civilization in Europe*, and of his *History of Civilization in France*. In January, 1830, Guizot was elected for the first time by the town of Lisieux to the chamber of deputies, and he retained that seat during the whole of his political life, that is, for eighteen years.

Guizot immediately assumed an important position in the representative assembly, and the first speech he

delivered was in defense of the celebrated address of the 221, in answer to the menacing speech from the throne, which was followed by the dissolution of the chamber, and was the precursor of another revolution. On his returning to Paris from Nîmes on July 27th, the fall of Charles X. was already imminent. Guizot was called upon by his friends Casimir Périer, Laffitte, Villemain and Dupin to draw up the protest of the liberal deputies against the royal ordinances of July, while he applied himself with them to control the revolutionary character of the late contest. The chamber of deputies assumed the powers of a convention, and placed the duke of Orleans on the throne. A ministry was formed under M. Laffitte, and although it comprised the great names of Count Molé, Marshal Gérard, Casimir Périer, and the Duc de Broglie, the department of the interior, then the most difficult and important in the state, was allotted to Guizot. In 1831 Casimir Périer formed a more vigorous and compact administration, which was terminated in May, 1832 by his death; the summer of that year was marked by a formidable republican rising in Paris, and it was not till October 11, 1832, that a stable government was formed, in which Marshal Soult was first minister, the Duc de Broglie took the foreign office, Thiers the home department, and Guizot contented himself with the department of public instruction. This ministry, which lasted for nearly four years, was by far the ablest and most comprehensive that ever served Louis Philippe. Guizot, however, was already marked with the stigma of unpopularity by the more advanced liberal party.

The object of the cabinet of October, 1832, was to organize a conservative party, and to carry on a policy of resistance to the republican faction which threatened the existence of the monarchy. The real strength of the ministry lay not in its nominal heads, but in the fact that in this government, and this alone, Guizot and Thiers acted in cordial coöperation. The two great rivals in French parliamentary eloquence followed for a time the same path; but neither of them could submit to the supremacy of the other, and circumstances threw Thiers almost continuously on a course of opposition, while Guizot bore the graver responsibilities of power.

Once again, indeed, in 1839, they were united, but it was in opposition to M. Molé, who had formed an intermediate government, and this coalition between Guizot and the leaders of the left center and the left, Thiers and Odilon Barrot, is justly regarded as one of the chief inconsistencies of his life. Victory was secured at the expense of principle; but none of the three chiefs of that alliance took ministerial office, and Guizot was not sorry to accept the post of ambassador in London, which withdrew him for a time from parliamentary contests. This was in the spring of 1840, and Thiers succeeded shortly afterward to the ministry of foreign affairs.

Guizot was received with marked distinction by the queen and by the society of London. His literary works were highly esteemed; his character was respected, and France was never more worthily represented abroad than by one of her greatest orators. He was known to be well versed in the history and the literature of England, and sincerely attached to the alliance of the two nations and the cause of peace. The warlike policy of Thiers was opposed to his own convictions. The treaty of July 15th was signed without his knowledge and executed in the teeth of his remonstrances. For some weeks Europe seemed to be on the brink of war, until the king put an end to the crisis by refusing his assent to the military preparations of Thiers, and by summoning Guizot from London to form a ministry and to aid

his majesty in what he termed "ma lutte tenace contre l'anarchie." Thus began, under dark and adverse circumstances, on October 29, 1840, the important administration in which Guizot remained the master-spirit for nearly eight years. He himself took the office of minister for foreign affairs, to which he added some years later, on the retirement of Marshal Soult, the ostensible rank of prime minister. His first care was the maintenance of peace and the restoration of amicable relations with the other powers of Europe. In his pacific task he was fortunately seconded by the formation of Sir Robert Peel's administration in England, in the autumn of 1841. Between Lord Palmerston and Guizot there existed, unhappily, an incompatibility of character exceedingly dangerous in the foreign ministers of two great and in some respects rival countries. With Lord Palmerston in office, Guizot felt that he had a bitter and active antagonist in every British agent throughout the world; the combative element was strong in his own disposition, and the result was a system of perpetual conflict and counter-intrigues. Lord Palmerston held (as it appears from his own letters) that war between England and France was, sooner or later, inevitable. Guizot held that such a war would be the greatest of all calamities, and certainly never contemplated it. In Lord Aberdeen, the foreign secretary of Sir Robert Peel, Guizot found a friend and an ally perfectly congenial to himself. The opposition in France denounced Guizot's foreign policy as basely subservient to England. He replied in terms of unmeasured contempt, "You may raise the pile of calumny as high as you will." The opposition in England attacked Lord Aberdeen with the same reproaches, but in vain. King Louis Philippe visited Windsor. The queen of England (in 1843) stayed at the Château d'Eu. In 1845 British and French troops fought side by side for the first time in an expedition to the River Plate.

The fall of Sir Robert Peel's government in 1846 changed these intimate relations; and the return of Lord Palmerston to the foreign office led Guizot to believe that he was again exposed to the passionate rivalry of the British cabinet. A friendly understanding had been established at Eu between the two courts with reference to the future marriage of the young queen of Spain. The language of Lord Palmerston and the conduct of Sir Henry Bulwer at Madrid led Guizot to believe that this understanding was broken, and that it was intended to place a Coburg on the throne of Spain. Determined to resist any such intrigue, Guizot and the king plunged headlong into a counter-intrigue, wholly inconsistent with their previous engagements to England, and fatal to the happiness of the queen of Spain. By their influence she was urged into a marriage with a despicable offshoot of the house of Bourbon, and her sister was at the same time married to the youngest son of the French king, in direct violation of Louis Philippe's promises. This transaction, although it was hailed at the time as a triumph of the policy of France, was in truth as fatal to the monarch as it was discreditable to the minister. It was accomplished by a mixture of secrecy and violence. It was defended by subterfuges. By the dispassionate judgment of history it has been universally condemned.

Guizot stuck stubbornly to Louis Philippe. In the afternoon of February 23, 1848, the king summoned his minister from the chamber, which was then sitting, and informed him that the aspect of Paris and the country during the banquet agitation for reform, and the alarm and division of opinion in the royal family, led him to doubt whether he could retain his ministry. That doubt, replied Guizot, is decisive of the question, and instantly resigned, returning to the chamber only to announce that the administration was at an end, and

that Molé had been sent for by the king. Molé failed in the attempt to form a Government, and between midnight and one in the morning Guizot, who had according to his custom retired early to rest, was again sent for to the Tuileries. The king asked his advice. "We are no longer the ministers of your majesty," replied Guizot; "it rests with others to decide on the course to be pursued. But one thing appears to be evident: this street riot must be put down; these barricades must be taken; and for this purpose my opinion is that Marshal Bugeaud should be invested with full power, and ordered to take the necessary military measures, and as your majesty has at this moment no minister, I am ready to draw up and countersign such an order." The marshal, who was present, undertook the task, saying, "I have never been beaten yet, and I shall not begin to-morrow. The barricades shall be carried before dawn." After this display of energy the king hesitated, and soon added: "I ought to tell you that M. Thiers and his friends are in the next room forming a Government!" Upon this Guizot rejoined, "Then it rests with them to do what they think fit," and left the palace. Thiers and Barrot decided to withdraw the troops. The king and Guizot next met at Claremont. This was the most perilous conjuncture of Guizot's life, but he found a safe refuge in Paris for some days in the lodging of a painter whom he had befriended, and shortly afterward effected his escape across the Belgian frontier and thence to London, where he arrived on March 3d.

The society of England, though many persons disapproved of much of his recent policy, received the fallen statesman with as much distinction and respect as they had shown eight years before to the king's ambassador. Sums of money were placed at his disposal, which he declined. A professorship at Oxford was spoken of, which he was unable to accept. His old friends resumed their relations with him. For himself, serene and undisturbed by a catastrophe which had shaken Europe, he immediately collected a few books and resumed the narrative of the British commonwealth, until he brought it down to Monk and Richard Cromwell.

Guizot survived the fall of the monarchy and the government he had served twenty-six years, and died in September, 1874.

GUJARAT. See GUZERAT.

GUJRÁNWALA, a British district in the Punjab, with an area (1889) of 2,563 square miles, and population of 600,000. At the first beginning of the Sikh war, the waste plains of Gujránwala were seized by various military adventurers. Charat Singh took possession of the village of Gujránwala, and here his grandson, the great mahārājā Ranjit Singh, was born. The Sikh rule, which was elsewhere so disastrous, appears to have been an unmitigated benefit to this district. Ranjit Singh settled large colonies in the various villages, and encouraged cultivation throughout the depopulated plain. In 1847 the district came under British influence, in connection with the regency at Lahore; and in 1849 it was included in the territory annexed after the second Sikh war. Since that time Gujránwala has enjoyed an immunity from the catastrophes of history, with the exception of the events of 1857, which belong to the general annals of India.

GUJRANWALA, the chief town and administrative headquarters of the above district, with a population of 19,381.

GUJRAT, or GOODJRAT, a British district in the Punjab; area 1901 2,029 square miles; population, 640,000. It is bounded on the northeast by the native state of Kashmir, on the northwest by the river Jhilam, on the west by Shahpur district, and on the southeast by

the rivers Távi and Chenáb. The district of Gujrát comprises a narrow wedge of sub-Himálayan plain country, possessing few natural advantages.

Numerous relics of antiquity stud the surface of Gujrát district. Mounds of ancient construction yield numbers of early coins, and bricks are found whose size and type prove them to belong to the prehistoric period of Hindu architecture. A mound now occupied by the village of Moga or Mong has been identified as the site of Nícea, the city built by Alexander the Great on the field of his victory over Porus. The Delhi empire established its authority in this district under Bahául Lodi (1450-1488). A century later it was visited by Akbar, who founded Gujrát as the seat of government. During the decay of the Mughal power, the Ghakkars of Rawal Pindi overran this portion of the Punjab and established themselves in Gujrát about 1741. Meanwhile the Sikh power had been asserting itself in the eastern Punjab, and in 1765 the Ghakkar chief was defeated by Sardar Gújar Sinh, chief of the Bhangí confederacy. On his death, his son succeeded him, but after a few months' warfare, in 1798, he submitted himself as vassal to the máhárájá Ranjít Sinh. In 1846 Gujrát first came under the supervision of British officials. Two years later the district became the theater for the important engagements which decided the event of the second Sikh war. After several bloody battles in which the British were unsuccessful, the Sikh power was irretrievably broken at the engagement which took place at Gujrát, February 22, 1849. The Punjab lay at the feet of the conquerors, and passed by annexation under British rule.

GUJRÁT, the chief town and administrative headquarters of the above district, with a population of 17,391, stands upon an ancient site, formerly occupied, according to tradition, by two successive cities, the second of which is supposed to have been destroyed in 1303, the year of an early Mughal invasion of Delhi.

GULF STREAM. See ATLANTIC.

GULL, the name commonly adopted, to the almost entire exclusion of the old English MEW, for a group of sea-birds widely and commonly known, all belonging to the genus *Larus* of Linnæus, which subsequent systematists have broken up in a very arbitrary and often absurd fashion.

Taking the gulls in their restricted sense, Mr. Howard Saunders, who has lately subjected the group to a rigorous revision (*Proc. Zool. Society*, 1878, pp. 155-211), admits forty-nine species of them, which he places in five genera instead of the many which some prior investigators had sought to establish. Of the genera recognized by him, *Pagophila* and *Rhodostethia* have but one species each, *Rissa* and *Xema* two, while the rest belong to *Larus*. The *Pagophila* is the so-called ivory-gull, *P. eburnea*, names which hardly do justice to the extreme whiteness of its plumage, to which its jet-black legs offer a strong contrast. The young, however, are spotted with black. An inhabitant of the most northern seas, examples, most commonly young birds of the year, find their way in winter to more temperate shores. Its breeding-place has seldom been discovered, and the first of its eggs ever seen by ornithologists was brought home by Sir L. McClinton in 1853, from Cape Krabbe. Of the species of *Rissa*, one is the abundant and well-known Kittiwake, *R. tridactyla*, of circumpolar range, breeding, however, also in comparatively low latitudes, as on the coast of Britain, and in winter frequenting southern waters. The other is *R. brevirostris*, limited to the North Pacific, between Alaska and Kamchatka. We have then the genus *Larus*, which ornithologists have hitherto attempted most unsuccessfully to subdivide. It contains the largest

as well as the smallest of gulls. The larger species prey fiercely on other kinds of birds, while the smaller content themselves with a diet of insects and worms. But however diverse be the appearance, structure, or habits of the extremities of the series of species, they are so closely connected by intermediate forms that it is hard to find a gap between them that would justify a generic division. Of the forty-three species of this genus recognized by Mr. Saunders it would be impossible within the limits of this article to attempt to point out the peculiarities. About fifteen belong to Europe and fourteen to North America, of which (excluding stragglers) some five only are common to both countries.

GUM exists in the juices of almost all plants, but is produced in its purest form by various species of *Acacia*. The name is applied to those exudations from plants, stems, branches, or fruits which are entirely soluble or soften in water, and form with it a thick glutinous liquid or mucilage insoluble in alcohol of sixty per cent., and yield mucic and oxalic acids when treated with nitric acid. In structure gum is quite amorphous, being neither organized like starch nor crystallized like sugar. According to Trecul, the acacias and the *Rosacea* yield their gums most abundantly when sickly and in an abnormal state, caused by a fullness of sap in the young tissues, whereby the new cells are softened and finally disorganized; the cavities thus formed fill with liquid, which exudes, dries, and constitutes the gum.

The chief varieties have hitherto been divided as follows:—gum arabic, gum tragacanth, cherry tree gum, gum of Bassora, mucilage.

Gum Arabic may be taken as the type of the gums entirely soluble in water. The principal kinds are distinguished as Turkey Picked Gum, Gedda, Amrad, Gheziri, Senegal, Talca, Australian, Barbary, Cape, and East India (from Bombay and Aden).

The finer varieties are used as an emollient and demulcent in medicine, and in the manufacture of confectionery; the commoner qualities are used as an adhesive paste, for giving luster to crape, silk, etc., in cloth finishing to stiffen the fibers, and in calico-printing. For labels, etc., it is usual to mix sugar or glycerin with it to prevent it from cracking. Physiologically nothing is yet definitely known of gum as a food material. Animals fed thereon soon die of inanition.

Gum senegal, a variety of gum arabic produced by *A. Vereke*, occurs in pieces generally rounded, of the size of a pigeon's egg, and of a reddish or yellow color, and specific gravity of 1.436. It gives with water a somewhat stronger mucilage than gum arabic, from which it is distinguished by its clear interior, fewer cracks, and greater toughness. It is imported from the river Gambia, and from Senegal and Bathurst, and is collected in December and March yearly.

Chagual gum, a new variety brought from St. Iago de Chili, resembles gum senegal. About seventy-five per cent. is soluble in water. Its solution is not thickened by borax, and is precipitated by neutral lead acetate; and dilute sulphuric acid converts it into dextroglucose.

Gum Tragacanth, familiarly called gum dragon, exudes from the stem, the lower part especially, of the various species of *Astragalus*, and is collected in Asia Minor, the chief port of shipment being Smyrna. Formerly only what exuded spontaneously was gathered; this was often of a brownish color; but now the flow of the gum is aided by incisions cut near the root, and the product is the fine, white, flaky variety so much valued in commerce. The chief flow of gum takes place during the night, and hot and dry weather is the most favorable for its production.

In color gum tragacanth is of a dull white; it occurs in horny, flexible, and tough, thin, twisted flakes, translucent, and with peculiar wavy lines on the surface. When dried at temperatures under 100° C. it loses about fourteen per cent. of water, and is then easily powdered. Its specific gravity is 1.384.

Gum tragacanth is used in calico-printing as a thickener of colors and mordants; in medicine as a demulcent and vehicle for insoluble powders, and as an excipient in pills; and for setting and mending beetles and other insects. Gum kuteera resembles in appearance gum tragacanth, for which the attempt has occasionally been made to substitute it.

Cherry Tree Gum is an exudation from trees of the genera *Prunus* and *Cerasus*. It occurs in shiny reddish rumps, resembling the commoner kinds of gum arabic. With water, in which it is only partially soluble, it forms a thick mucilage. The soluble portion is arabin.

Gum of Bassora, from Bassora or Bussorah in Asia, is sometimes imported into the London market under the name of the hog tragacanth. It is insipid, crackles between the teeth, occurs in variable-sized pieces, is tough, of a yellowish-white color, and opaque, and has properties similar to gum tragacanth. Very many seeds, roots, etc., when infused in boiling water, yield mucilages which, for the most part, consist of bassorin. Linseed, quince seed and marsh-mallow root yield it in large quantity. (See also GUMBO.)

Gum Resins.—This term is applied to the inspissated milky juices of certain plants, which consist of gum soluble in water, resin and essential oil soluble in alcohol, other vegetable matter and a small amount of mineral matter. They are generally opaque and solid, and often brittle. Their chief uses are in medicine. They include the following:—ammoniacum, asafetida, bdellium, euphorbium, frankincense or olibanum, galbanum, gamboge, myrrh, opoponax, sagapanum and scammony. Several of the resins are often improperly called gums; e.g., benzoin or benjamin, copal, dammar, elemi or animi, kawrie or cowdie or Australian copal, mastic, sandrac and shellac.

GUMBINNEN, the chief town of a government district of the same name in the Prussian province of East Prussia, is situated on the Pissa, an affluent of the Pregel, and on the Eastern Railway, twenty-two miles southwest of Eydtkuhnen on the Russian boundaries. Population about 13,000.

GUMBO, or OKRA, an herbaceous hairy annual plant of the natural order *Malvaceæ*, a native of the old world, and naturalized or cultivated in all tropical countries. The leaves are cordate, and three to five lobed, and the flowers yellow, with a crimson center; the ovary is five celled, and the fruit or pod, the *Bendi-Kai* of the Europeans of southern India, is a tapering, ten-angled, loculicidal capsule, four to ten inches in length, except in the dwarf varieties of the plant, and contains numerous oval dark-colored seeds, hairy at the base. Three distinct varieties of the gumbo (*Quiabo* and *Quingombo*) in Brazil have been described by Pacheco. The unripe fruit is eaten either pickled, or prepared like asparagus. It is also an ingredient in various dishes, e.g., the *gumbo* of the southern United States, and the *calalou* of Jamaica; and on account of the large amount of mucilage it contains, it is extensively consumed, both fresh and in the form of the prepared powder, for the thickening of broths and soups. For winter use it is salted, or sliced and dried.

GUM-BOIL, an abscess near the root of a tooth, and discharging itself toward the mucous membrane of the gum; usually superficial, but sometimes more deeply-seated in connection with the bone, and causing con-

siderable deformity, with risk of caries or necrosis. Gum-boil should be treated, in the first instance, by simple protection against cold and external injury; but as soon as the presence of matter can be ascertained, it is usually good practice to give vent to it by a free incision.

GUMRI, or as it is now more frequently called ALEXANDROPOL, in honor of the empress Alexandra, a town of Russian Armenia, in the province of Erivan, on the old frontier of the Turkish territory which was formed by the river Arpachai. It is situated 5,268 feet above the sea.

GUM-TREE. See EUCALYPTUS.

GUN-COTTON. In 1838 Pérouze observed that when cotton fabrics or paper were immersed in cold concentrated nitric acid for a short time, the free acid being subsequently removed by washing, these materials became, without important alteration of structure, converted into substances possessed of explosive properties. These were at the time accepted as closely allied to the substances named *xyloidin*, described some years previously by Braconnet, which is obtained by adding water to a solution of starch in cold nitric acid. But subsequent observations established the identity of these explosive products with the explosive cotton, or gun-cotton, of which in 1845 Schönbein announced the discovery, and which he at once proposed as a substitute for gunpowder. Soon after the announcement Böttger and Ott published the method of producing gun-cotton by immersing carded cotton in cold concentrated nitric acid, and subsequently Knop introduced the more advantageous method of treating the cotton wool with a mixture of nitric and sulphuric acids, the latter being used as a dehydrator of the nitric acid, and as an absorbent of the water eliminated by the nitrification of the cellulose or cotton fiber. The composition of gun-cotton was subsequently made the subject of study by Böttger, Pérouze, Pélégot, Von Kirchhoff, Sobrero, Béchamp, Porret, Crum, Gladstone, Hadaw, and others, and various formulæ were proposed as representing its composition. The divergence of opinion on this point arose partly from difficulties attending the preparation of uniform products, and the obtaining of trustworthy analytical results with these, and partly from differences of opinion regarding the nature of the chemical explosive body. The products obtained in the earlier investigations differed very much as regards their solubility in mixtures of alcohol and ether, and also with respect to the proportion which their weight bore to that of the cotton wool employed in the experimental operations. Crum was the first to entertain the view that gun-cotton might be regarded as cellulose, in which the two or three atoms of hydrogen are replaced by their equivalent of nitric peroxide. This view was afterward also advanced by Gerhardt, and it received strong support from the researches of Hadow, whose results established the fact that several distinct varieties of pyroxilin could be produced by varying the proportions of nitric and sulphuric acids used, and who definitely established the composition of three of these, the most explosive of which constituted the chief proportion of the product ordinarily obtained as gun-cotton, and had the composition expressed by the name trinitrocellulose. This highest nitro-product in its pure state is insoluble in mixtures of ether and alcohol, whereas the lower products (one of which is the so-called *collodion gun-cotton*, used for photographic purposes (see COLLODION)) differed in regard to their ready solubility in different mixtures of those solvents.

The occurrence of a violent explosion at the works of Messrs. Hall of Faversham, England, not long after they had commenced the manufacture of Schönbein's

gun-cotton wool, followed by a similar casualty in France, led to the abandonment of endeavors to apply this substance, within a brief period of its discovery, except in Austria, where Von Lenk persevered in attempts to devise means for obtaining it in a purer and therefore more staple condition, as well as for bringing its explosive action sufficiently under control to permit of its advantageous employment as a substitute for gunpowder, not only for destructive but also for projectile purposes. The system of manufacture elaborated by Von Lenk consisted in loosely spinning long staple cotton into yarn of various sizes and different compactness; this yarn was converted into gun-cotton by very careful treatment with a large excess of the strongest nitric and sulphuric acids, the product being immersed for many weeks in running water, and then treated with weak alkali; the gun-cotton yarn and thread were either wound more or less compactly on reels or cores, for employment in firearms, or made up into very compact ropes with hollow cores, or into plaits, of lamp-wick form, for employment in shells or mines. The rapidity of explosion of the gun-cotton, *in open air*, or under slight confinement, was thus brought to a great extent under control, but if the resistance opposed to the expansion of the highly heated gases upon the first ignition of the confined gun-cotton developed sufficient pressure to cause them at once to penetrate the inner structure of gun-cotton fiber which composed a charge, a sudden and violent explosion was thus brought about. By the system which Abel has more recently elaborated the fiber after its conversion into gun-cotton is reduced to a very fine state of division; when in this condition the explosive substance is readily converted into sheets or granules, or by compression into homogeneous masses of various degrees of compactness, and of any desired form. In this manner the rapidity of action or explosion of gun-cotton may be reduced to a minimum, though uniformity of action in firearms is still very difficult to attain with it. As the reduction of the gun-cotton fiber to a very fine state of division greatly facilitates the removal by washing, and by alkaline treatment, of the small quantities of unstable impurities already spoken of, the stability of gun-cotton as now manufactured is much greater than that of former products. Compressed gun-cotton needs, like the other forms in which this explosive has been used, very strong confinement for the development of violent explosion, but this can be readily accomplished without any confinement of the substance, through the agency of an initiative detonation.

Compressed gun-cotton may therefore be applied to minning and blasting work, but the most explosive kind producible is inferior in strength to an equal quantity of dynamite. Gun-cotton has the great advantage over dynamite that it does not freeze. An advantage of nitro-glycerine and its preparations is that they remain unaltered under water, and can be used in wet bore-holes with the same facility as in dry holes, consequently dynamite is preferred for submarine work. The expense of producing gun-cotton is from 20 to 25 per cent. higher than dynamite. Gun-cotton in small charges has been used in shot guns, but is only suitable in cases where, as in duck-shooting, a quick-burning powder is desired. For ordinary use it is disqualified by its too great rapidity of explosion and inequality of pressure.

Gun-cotton, if it consists entirely of trinitrocellulose, does not contain sufficient oxygen for the complete oxidation of its carbon; hence more work can be accomplished with a given weight of gun-cotton if a solid oxidizing agent (a nitrate or a chlorate) be incorporated with it in proportion sufficient for complete oxidation.

The compressed preparations (chlorated or nitrated gun-cotton) are as sensitive to detonation as gun-cotton itself, but are less sudden or sharp in their action. These preparations, first manufactured by Abel, were extensively experimented with some years ago, and one of them, prepared with barium nitrate, is now manufactured under the name of *tonite* for blasting purposes. Preparations allied to gun-cotton, in the production of which wood-fiber is used as the starting point, are manufactured for sporting and blasting purposes under the name of Schulze's powder, sawdust powder, and patent gunpowder.

GUNDULITSCH, IVAN, called GIOVANNI GONDOLA, one of the most celebrated Dalmatian poets, was born August 8, 1588, at Ragusa. His early education was superintended by two Jesuits, S. Muzzi and R. Ricasoli, the latter of whom instructed him in philosophy. At the age of twenty Gundulitsch applied himself to the study of jurisprudence; and three years afterward he was intrusted with a high official post in the Ragusan republic. Further particulars of his life are not known; he died December 8, 1638.

GUNDWANA, a form of the name GONDWANA.

GUNMAKING. Under this head falls the manufacture of every description of firearm, from the pistol to the 130-ton gun. The term "small arms" includes sporting and military weapons carried by the shooter; instruments fitted for firing a rapid succession of bullets through one or more barrels from a rest are termed "machine guns;" while the heavier pieces used exclusively in war, are denominated "ordnance."

The date and circumstance of the introduction of portable firearms are involved in obscurity. No doubt many attempts were made and failed previously, but gunpowder does not appear to have come into practical use as a rival to the crossbow for the propulsion of bolts or bullets till the reign of Edward III.; in 1375 mention is made of men armed with "gonnes" at an attack made on a Yorkshire manor-house. The *arquebuse à mèche* was employed in Germany in 1378, and it is therefore probable that some rough weapon was introduced much earlier. The hand-gun was used by both infantry and cavalry; it consisted of a simple iron or brass tube with touch-hole at the top, fixed on a straight stock of wood; when used on foot, the soldier held it firmly by passing the stock under the arm; when used on horseback the stock was shortened to butt against the breast, the barrel resting on a fork secured to the saddle-bow. About the beginning of the reign of Henry VII. the hand-gun was improved by the addition of a cock, which was brought down by a trigger to a pan at the side of the barrel; this cock held a match which ignited a priming in the pan, the priming communicating with the charge by a small hole. The next alteration consisted in the introduction of the wheel-lock, in which a steel wheel, rasped at the edge, protruded into the priming pan. Into the cock was fitted a piece of sulphuret of iron (pyrites) instead of a match; this was kept down to the priming pan by a spring; another spring, when wound up, acted on the wheel, which, when released by the trigger, spun round, rubbing against the pyrites and causing sparks, which set fire to the priming. The wheel-lock was, however, found to be complicated, expensive, and uncertain, so that the match-lock remained in use till the middle of the seventeenth century, when it was displaced by the flint-lock, the earliest form of which, the "snaphaunce," seems to have been invented about the end of the sixteenth century in Germany. In this lock the priming pan was provided with a steel cover, and the cock held a flint; on pulling the trigger the cock fell, the flint struck the steel cover, forcing it back from the pan, evolving at the same time sparks,

which fired the priming. During these developments of the lock the shape of the barrel was gradually changed; in 1621 the length of that of the musket was four feet, and the size of the bore such that twelve bullets weighed one pound. Soon after this the infantry soldier was supplied with a dagger, which fitted into the muzzle and served as a pike. This was improved at Bayonne into the bayonet, and during the latter part of the seventeenth century was still farther improved by the addition of a socket, so that the musket could be fired while the bayonet was fixed ready for use. Little change in firearms took place in the eighteenth century, but in 1807 a Scotch clergyman named Forsyth obtained a patent for priming with fulminating powder, an invention which, though it slumbered till 1834, was destined to cause a complete revolution in the mechanism of firearms. Early in the present reign its value was fully recognized; the magazine of detonating composition and the priming pan used by Mr. Forsyth were improved into the cap and nipple, and the flint-lock was entirely superseded.

For sporting purposes smooth-bored shot-guns and grooved rifles are employed. Both are nearly always double-barreled, and of late years the old muzzle-loaders have been almost entirely supplanted by the many breech-loading systems recently invented, which enable the sportsman to reload with greatly increased rapidity and uniformity, the latter quality being specially important in rifle-shooting. The chief parts composing the arm are the barrel, the lock and the stock. Barrels for sporting arms are made of four different kinds of material—Damascus twist, laminated steel, stub iron and mild cast-steel; besides these, common material is worked up into cheap barrels for exportation. Damascus twist consists of alternate rods of iron and steel placed one upon another; usually six of each kind are thus arranged; they are then forged and thoroughly welded together into a solid bar, which is afterward rolled into rods having a section about three-eighths of an inch square. The rod thus formed is raised to a brightish red heat, and one end of it is placed in a revolving chuck, while the other remains fixed; the turning of the chuck subjects the rod to a severe twisting throughout its whole length, so that at last it acquires the appearance of a screw having a very fine thread. Three of these rods are placed together, the twist of one being in a contrary direction to that of the other two. They are then welded together into a bar, and rolled into a strip about three-fourths of an inch in width. The thickness of this strip depends on the part of the barrel it is intended to form; if for the breech end it is made one-fourth of an inch thick; if for the center, three-sixteenths of an inch; if for the muzzle, one-eighth of an inch. These strips are now ready for coiling, which is performed by raising the strip to a bright red heat, fixing one end of it to a hook projecting from a taper mandril, which is placed in a machine and provided with a handle. On turning the handle the strip is wound round the mandril into a coil about ten inches in length. The coil is then welded by about three inches at a time, till the spirals unite to form a hollow cylinder; it is then hammered on a small mandril till the welding is complete. Three coils welded together end to end form a barrel, to which the three different thicknesses of metal above mentioned give a slightly conical form, approximating to the ultimate shape. About three-fourths of the material is cut away in the making; sixteen pounds of iron are used in the first instance to make a pair of barrels, which weigh only eight pounds when the welding is finished, and only between three and four pounds after boring and grinding. In the manufacture of laminated steel barrels the best quality of steel-scrap, after thorough cleaning in a

revolving drum, is mixed with a small proportion of charcoal iron. The mixture is heated in a furnace, and puddled into a ball, which is well worked up under a forge hammer. It is then drawn out under a tilt hammer, and rolled into strips of the required length and thickness, after which it is treated as above described. This material is much esteemed for its hardness and closeness of grain, but it does not possess the elegant marking and appearance of the Damascus twist. Stub iron for barrels was formerly made by putting a quantity of old horse-shoes or stubs into an iron ring, welding them into a solid mass, and then rolling them out to strips of the requisite dimensions. Now a mixture of best wrought scrap, and sometimes steel scrap with stubs is preferred, as giving more hardness and durability to the barrels. A description of the manufacture of cast-steel barrels will be found below, in connection with military rifles. A sham-twist barrel is apt to impose on the purchaser; plain iron is cheaper than twisted iron, and sometimes a thin coil of twist is rolled round a plain inner tube; the whole is then welded together, and has all the appearance of a genuine twisted barrel. Other cheap barrels are made by rolling up strips of iron plate, and welding them together so that each barrel has a weld running down its whole length. As the breech end is thicker than the muzzle end, these barrels are usually made in two lengths.

In the rough state just described the barrels are sent from the forge to the gunmaker, who bores them carefully out to nearly the finished size. He then turns them down at intervals, obtaining correct surfaces by means of inside and outside gauges. The barrels are then "stripped"—that is, turned down the whole length to correspond with the bore. For double guns two barrels are now brazed together, near the muzzle and near the middle. At the breech the barrels are separated by a "steel lump." The axes of the barrels are not quite parallel to each other, but are usually adjusted to cross at about forty yards from the gun.

The best stocks are made of English or Italian walnut, pieces of which reach the gunmaker roughly shaped. They are so cut that the grain shall run lengthways down the stock, and the wood is dried and seasoned to prevent warping. For expensive guns, much attention is paid to beauty of mottling and depth of color. A considerable variety of tools is employed in shaping the stocks and cutting out the beds for locks, processes which, for sporting pieces, are performed by hand. All parts of the lock except the plate are of steel, and reach the gunmaker hammered into shape. The lock plate is of wrought iron, case-hardened. The parts are worked to fit by hand with a number of special tools. Bar locks are those which have a forward action, arranged so that the main spring fits under the bar below the breech end of the barrels; back-action locks have the spring reversed so as to extend down the hand or grip of the stock. The remaining portions of the gun are termed the furniture. They are the heel-plate which covers the butt, the break-off into which the breeching hooks for muzzle-loaders, the trigger plate, the trigger guard, the hammers, the escutcheons, and bolt fastening the barrel to stock, etc. For breech-loaders the action is a most important part of the furniture. The ingenuity of gunmakers has devised an immense variety of actions, and every day sees progress made in strength and simplicity. M. Lefauchaux is entitled to the credit of inventing the modern sporting breech-loader. He first hit on the combination of a pair of barrels open at the breech, playing on a hinge and abutting against a false breech, with a strong-based cartridge-case containing powder and shot ready for firing, and supplied with its own

means of ignition. His early guns were found weak in the fastening of the barrels to the stock, while the mode of igniting the charge was far from perfect. It consisted of a pin passing through the upper part of the cartridge case, the point resting just above a percussion cap placed at the center of the base of the charge; the hammer fell on the head of the pin, driving the point into the cap, and exploding the detonating composition. The gas was found to escape through the pin hole, the extraction was sometimes difficult, and a fall on hard ground would occasionally explode the cartridge; for these reasons the pin system was superseded by the central-fire method, in which the base of the cartridge case was made to hold a small anvil, on to which the cap was driven by a needle or striker passing through the false breech, and receiving the blow of the hammer. In this system the extraction is accomplished automatically, by a piece of steel fitting between the two barrels, and so cut as to clip the rims of both cartridges. To this extractor is attached a rod which runs down between the barrels through a hole in the steel lump as far as the hinge; on opening the joint the rod is driven backward, carrying with it the head and forcing the cartridge cases out of the barrels. Guns on the central-fire system afford no indication of being loaded; extraction and loading are, however, so rapid and easy that every sportsman should invariably withdraw the cartridges on laying down his gun, and reload on again taking the field. Hammers sometimes catch in the brambles, or even in the clothes of the shooter; even the double grip has been known to yield under the effect of the heavy charges now used. The latest guns leave little room for improvement in respect to the action. The hammers are abolished together, the striker being a needle in the interior, which is driven against the cap of a central-fire cartridge by a spring when the trigger is pressed; a lever on the top is pushed aside by the thumb, liberating the catch which holds the barrels against the false breech; the barrels then drop from the hinge, and are open for loading. On raising the barrels the action snaps to, and holds them fast; the dropping of the barrels causes an extractor to withdraw the empty cartridge cases. A key at the side regulates the cocking and safety of the lock and striker. The sizes of barrels are designated according to the weight of the solid spherical lead ball which will just fit them, and hence their diameters vary inversely as the cube roots of their numbers.

Barrels were formerly bored cylindrically, but the experiments of gunmakers led them to suppose that better shooting could be obtained by boring to shapes departing in various ways from the simple cylinder. The first modification introduced consisted in enlarging the breech end slightly for about ten inches; subsequently the last few inches at the muzzle were enlarged also, so that the barrel really consisted of two frusta of cones, having the smaller ends together—the position of the narrowest part, like many other matters, was dependent on the fancy of the gunmaker. Of late an attempt has been made to reduce the interior form of the barrel to something like a system, and several kinds of "choke" boring have been introduced. The object to be attained with a shot-gun is to so arrange the charge that the pellets shall be uniformly and thickly distributed round the mean trajectory, and shall also occupy a small space longitudinally.

The manufacture of sporting rifles does not greatly differ from that of shot-guns. Greater strength and weight of barrel are necessary to resist the pressure of the charge, withstand the wedging action of the bullet, and deaden the recoil. The breech-closing action also demands greater strength, but the general arrangements are not different in principle. Rifles for sporting pur-

poses differ from military pieces in being double-barreled, and in requiring accuracy and penetration at short ranges, instead of flat trajectory at very considerable distances. Hence they generally resemble the shot-guns in their action, and fire more powder in proportion to the weight of the bullet than military rifles.

The principle of rifling small arms seems to have been discovered about the beginning of the sixteenth century, but does not appear to have been employed for warlike purposes till the middle of the seventeenth. The difficulty of loading a rifle after firing a few rounds was the great obstacle to its use in the field. Several methods were devised of providing annus at the bottom of the bore on which a loose ball dropped in could be hammered to fit the grooves, but the principle of expansion by the action of the powder was not brought forward till 1836, when Mr. Greener submitted an egg-shaped bullet, having an opening at one end to receive a conical plug, which, when driven home by the gas, expanded the bullet into the grooves. Shortly after this, the French chasseurs were armed with a rifle throwing an elongated bullet with a hollow-coned base. This was improved by Captain Minié, who added an iron cup to fit into the cone and expand it when forced home by the gas. For this cup a wooden plug was substituted in the three-grooved Enfield rifle in 1855. About this time Sir J. Whitworth brought forward his hexagonal rifling, the guiding idea of which was that every part of the hexagon, except the actual corner, should do its share of the work of giving rotation. He proposed for a barrel thirty-nine inches long, a bore of .45 inch, having one turn in twenty inches. This was intended to be suitable either for an expanding bullet, or for one possessing an easy mechanical fit. The length of the bullet was increased, and the form thus modified suffered much less from the resistance of the air than the previous patterns. The question of breech-loading for military weapons now began to assume importance. About 1841 the Prussians had adopted the needle-gun, a breech-loader on the bolt principle. It was a rough weapon compared with the pieces lately introduced, but a great advance on any known at the time. A conical bullet rested on a thick wad, behind which was packed the powder, the whole being enclosed in strong lubricated paper. The detonator was in the center of the hinder surface of the wad, so that to explode it a needle had to be driven forward from the breech through the base of the cartridge and through the powder. This was accomplished by the action of a spiral spring, when set free by the pulling of the trigger. This arrangement possessed many defects; the gas escaped freely at the breech: the long needles rusted and broke; the springs failed, and the weight of the piece was excessive. Such failings caused the sterling merit of the principle to be underrated, and it was not till 1864 that a committee of officers recommended the introduction of breech-loading arms for general adoption in the British army. The triumph of Prussia in the seven weeks' war with Austria in 1866, at once drew attention to the urgency of the case, and caused all civilized powers to rearm their troops. In England, the Enfield rifles (three-grooved expanding bullet muzzle-loaders) were converted into breech-loaders by the adoption of the Snider method, which consisted in cutting away two inches of the upper part of the breech end of the barrel so as to admit the cartridge, which was pushed forward into a chamber formed by enlarging the end of the bore. A block, opening on a hinge, was then shut down to fill up the space behind, forming a false breech against which the base of the cartridge abutted. The striker consisted of a needle passing through this breech block; when struck from behind by the hammer it was driven against a cap in the

base of the cartridge, exploding the charge. Proposals were then invited, and a number of inventions submitted, the result of which was that in 1869 the combination of the Martini breech action with the Henry barrel was decided on for future manufacture, and the whole of the British army is now provided with these weapons. The general principles of manufacture are the same for all kinds of military breech-loading rifles.

The Vetterli gun used by the Italians and Swiss, is a repeater or magazine gun. It contains a supply of eleven cartridges, arranged in a tube running under the barrel, and forced by a spring in to the loading position one by one, as the previously fired empty one is extracted. The arm can thus fire twelve rounds with great rapidity without reloading; it can also be used as an ordinary breech-loader, a fresh cartridge being inserted at every round, and the magazine kept constantly full. This is no doubt a great advantage under certain circumstances, but entails grave inconveniences. Thus the Vetterli gun, with magazine full weighs just half as much again as the Martini-Henry, and gives less energy to its bullet at the muzzle in the proportion of five to eight, a proportion which increases to the disadvantage of the magazine gun as the range increases. Still, for a *mêlée*, and at short ranges, the Vetterli is no doubt a very formidable piece.

These considerations have led the Government of the United States to make trials of a number of magazine guns, of which one is the Hotchkiss. The magazine is contained in the stock, and holds five cartridges, a sixth being in the chamber ready for firing. These cartridges are the same as those used for government Springfield rifles; they are pushed successively into the loading position by a spiral spring till the magazine is empty, or a fresh cartridge can be inserted after each round as in an ordinary breech-loader. The action of bringing the knob-handle upright and withdrawing the bolt extracts and throws out the emptied cartridge to the side; the next cartridge is then pushed up into the loading position by the spring, and is forced into the barrel when the handle presses the bolt forward; this action also cocks the piece, but the striker cannot reach the cartridge till the knob-handle is turned down, and the bolt thus locked in position. The weight of the piece fully loaded is nine and a half pounds.

Of all the military rifles adopted by the various governments, the Springfield (breech-loader, United States), the Berdan (breech-loader, Russia), and the Lee (magazine gun), are the most powerful; and the test the Martini-Henry underwent in Turkey, where a cheap gun of this pattern was supplied on contract by an American firm during the war of 1877-78, was most satisfactory.

Pistols.—These handy little weapons were formerly made as single or double-barreled, smooth-bored, muzzle-loaders, and their system involved no departure in principle from the ordinary firearm of the day. The introduction of the revolver as a practical weapon was a great step in advance; the idea is old, and roughly constructed weapons on the same plan have long existed in museums of old arms; Colonel Colt, of the United States, revived it and is the father of the modern revolver. In his original pistol a revolving, muzzle-loading cylinder contains a number of chambers, usually five or six, bored from the front parallel to the axis; the back of the cylinder is left solid, and forms the breech; a nipple is screwed into each chamber. As the cylinder revolves, each chamber arrives at the top, and is then opposite to a barrel; the pistol is cocked by the thumb, an action which locks the chamber against the barrel, so that the two form a continuous bore; the trigger is pulled in the usual way, and the hammer brought down on the upper nipple, exploding the charge in the top chamber. The

action of recocking brings the next chamber into position. When on half-cock, the cylinder revolves freely. Since Colt's time great improvements have been made in these handy weapons; the trigger was made to cock the hammer, turn the cylinder and fire the charge by one continuous draw; this arrangement enabled the shooter to fire all the shots very rapidly without lowering his hand; the strength of mainspring required, however, rendered it very difficult to shoot with any degree of accuracy, especially as the exact moment when the hammer would fall was hard to estimate. A second improvement gave the shooter the choice of cocking the hammer and firing it in the usual way, if he preferred it. The next step was to make the chambers breech-loading, by boring them right through, and packing the powder and bullet in a strong based cartridge, carrying its own ignition. In pistols constructed on this plan the chamber arriving at the top is brought against a false breech through which the striker is driven by the hammer. In the latest pattern of this pistol, the cylinder and barrel open away from the false breech on a hinge underneath; the action of opening throws out the empty cartridge cases. If the user is on horseback, he thrusts the barrel-muzzle downward into his breast, belt or holster, the hinge remaining open; fresh cartridges are taken out of the pouch and placed in the chambers; the breech is closed sharply on the hinge and is held by a snap-catch; the pistol is then withdrawn ready for use. All this can be very quickly done with one hand while at full gallop.

Machine Guns.—This term comprehends all weapons made to fire a rapid succession of bullets from a stand or carriage, so that, while requiring but two or three men to work them, they may throw in a fire equal to that of a detachment of infantry. In the Franco-German war of 1870 a species of *mitrailleuse* was largely employed, and when used under favorable conditions attained fair success. It consisted of a number of barrels (usually twenty-five or thirty-seven) secured in a frame round an axis, and parallel to it. The barrels were open at the breech, and were loaded by a disc pierced to correspond with them containing a cartridge in each chamber. This disc was placed against the breech end of the barrels, the false breech containing the strikers was held firmly against it, and the whole of the charges were exploded at once. This arrangement had many defects. The recoil of so many charges fired simultaneously required strength and weight; at short ranges the bullets all went to the same spot; the number of rounds could not be regulated at pleasure; and only volleys could be fired. The Gatling machine gun, which first appeared in the United States, was vastly superior to the mitrailleuse, and speedily obtained entrance into the armies of most of the civilized powers.

The manufacture of ordnance is a much more scientific and complicated study than that of small arms. As the forces increase in magnitude and intensity, while the ultimate strength of material remains constant, the nicety of adaptation of means to ends grows *pari passu* with the guns. In producing a piece of ordnance, two distinct sets of conditions are involved—those belonging to its actual construction, and those by which its proportions are regulated. In constructing a gun, the material must be so selected and disposed as economically and safely to sustain the effect of the forces developed by the charge; in designing a gun, it is necessary to know the nature and direction of the forces which will combine to produce the desired ballistic results. The two sets of conditions are as distinct as those involved in the separate operations of writing and printing this article.

Nearly all the accurate knowledge as yet obtained of

the true action of gunpowder has been acquired within the last twenty years. The general idea previously held was that the explosion was instantaneous, and that the more violent the powder the greater would be the velocity of the projectile. The mode of proving the quality of the explosive was to place a small quantity in a short mortar, and to measure the distance to which it projected a light shell—a test altogether wrong in principle, as will be shown later on. No accurate idea had been formed of the true pressure of the powder gas on the bore during discharge; but it was understood that a gun was subjected to two principal strains or stresses—a circumferential tension tending to split the gun open longitudinally, and a longitudinal tension tending to pull the gun apart in the direction of its length.

When guns are made of cast metal, and are, in fact, homogeneous hollow cylinders, a limit is soon reached beyond which additional thickness is practically useless in giving strength to resist the circumferential tension. Supposing the metal employed to be incompressible, each concentric layer would take up a strain on discharge inversely proportionate to the square of its distance from the axis of the bore. Every metal, however, is compressible as well as extensible, and hence the exterior always affords more support to the interior than the foregoing rule indicates. The great aim, then, of a gunmaker is so to select and arrange his material that the exterior shall take up as much as possible of the strain thrown upon the interior.

In America, Captain Rodman introduced a method of casting guns hollow and cooling them down from the interior, so that the inner portions being first solidified were compressed and supported by the contraction of the outer parts when they subsequently cooled down. Thus, on discharge, the compressed inner portions expanded under the action of the powder gas to or beyond their natural diameter, throwing at once the strain on the outer portions which were already in a state of tension. But, however, well cast-iron may be disposed of, it is naturally too weak and brittle for use with heavy guns, and those nations which employ it thus do so because it is comparatively cheap and easy to manufacture, and, not because it is the best material. Austria and Russia have of late years made light guns of bronze cast in chill, and subject to the wedging action of steel mandrils driven through the bore. The several layers of the metal are thus placed in a state of tension as regards the exterior, and of compression as regards the interior. At the present day systems of building up guns have been devised so that each portion of the metal is made to bear its fair share of the strain.

The longitudinal tension is usually less important than the circumferential stress. It is considered to be provided against in homogeneous guns if the metal is as thick over the bottom of the bore as round the end. The strain is now measured by calculating the total pressure of the powder gas on the bottom of the bore, and comparing it with the area of the transverse section of the gun at the same place. This is not absolutely correct; but, practically, the chief modes of gun construction now adopted leave a considerable margin of strength in this direction.

Sir William Armstrong first successfully employed the principle of initial tensions for all parts of a gun. In his system, wrought iron coils are shrunk over one another, so that the inner tube is placed in a state of compression and the outer portions in a state of tension, an endeavor being made to so regulate the amount of tension that each coil should perform its maximum duty in resisting the pressure from within. Further, he arranged the fiber of the several portions so as to be in the best positions for withstanding the pressures. It must be

noted that wrought-iron bar is about twice as strong in the direction of the fiber as across it. He therefore constructed the exterior of the gun of coiled bars of wrought iron welded into hoops and shrunk one over the other, thus disposing the fiber to resist the circumferential strain. These outer coils were shrunk over a hollow cylinder of forged iron, having the fiber running lengthways so as to resist the longitudinal strain. Within this cylinder or forged breech-piece was placed a steel tube, gripped in a like manner by shrinkage. This grand principle of modern gun construction is carried out by turning the inner coil in a lathe to an exterior diameter slightly greater than the interior diameter to which the outer coil is bored. The outer coil is expanded by the application of heat, and slipped over the inner one. It contracts on cooling, and if the strength of the two coils is properly adjusted, the outer will remain in a state of tension, and the inner in a state of compression. On this view, the ideal gun would be constructed of a vast number of excessively thin rings so shrunk over each other that, on discharge, each should be equally strained. An attempt has been made by Mr. Longridge, M.I.C.E., to approximate to this condition by winding steel wire under tension round a steel tube. This system, though possessing much ingenuity, has never made way, and might possibly be found wanting in longitudinal strength.

Great success attended the early introduction of the coil principle. Guns of considerable size were made; the largest weighed as much as twenty-three tons, and projected a 600-pound shot with a fair velocity. It was found, however, that much difficulty attended the accurate shrinking of a number of thin rings, and that occasionally one or more of the outer ones would be strained to cracking, while the inner ones were intact.

The great German gunmaker, Krupp, employs nothing but steel in the manufacture of his ordnance. His earlier pieces were bored from solid blocks of this metal forged under heavy hammers. They were homogeneous, and therefore the exterior did not assist the interior to bear the strain of the powder gas on discharge to the extent which scientific methods of construction admit. Still the excellent quality of the material enabled the artillery to get results from these pieces which have been surpassed only by the coil guns, and by Krupp's later productions. As, however, progress was made and the ratio of power to weight increased, it was found necessary to introduce a system of building up for steel ordnance also, and Krupp adopted the principle of shrinkage to which the English guns owed so much. The interior of the recent German gun is a steel tube as in the Armstrong construction, but it is very much thicker and forms the body of the piece, instead of being chiefly used to provide a sound surface for the bore. It is thickest over the powder and shot chambers, tapering toward the muzzle. Over the thickest part, and in some guns over a considerable portion of the chase, hoops of cast steel are shrunk on—the shrinkage being adjusted to bring the strength of the outer hoops into play to support the body of the gun on discharge. The number of hoops depends on the size of the gun and the severity of the strain it has to withstand; they are usually much more numerous than the English coils, and the section of a heavy Krupp gun presents somewhat the appearance of a stone wall. It is believed that the steel is not toughened in oil, but the details of manufacture have not as yet been made public.

Steel of the excellent quality employed by Krupp is undoubtedly a stronger material than wrought iron; its present trustworthiness is, however, of late date, and it has hardly gained the general confidence accorded to wrought iron.

In France and Italy a combination of cast iron and steel has been introduced with a view to economy. The interior of the gun is a moderately thick steel tube as in the coil guns; over this is a thick cast-iron body, corresponding to the steel body of the Krupp guns. On the exterior are shrunk steel hoops.

The comparative advantages of breech-loading and muzzle-loading for ordnance on service are fully discussed in the article GUNNERY. We have now to mention the principal modes of closing the breech, either permanently as in muzzle-loaders, or temporarily as in breech-loaders. The former is comparatively a simple matter. When the whole gun, or the interior of it, is formed of cast metal, iron, bronze, or steel, the block is merely bored to the required depth, and the end left unbored to form the breech. Should the inner part of the gun be formed of wrought material, such as coils, it becomes necessary to close the end with some device which shall render it gas-tight and strong. Several kinds of cups and plugs have been tried for this purpose, the most successful of which is the cup which is generally used in the case of the converted guns. When we come to the temporary closing of the end of the bore demanded by breech-loading, a far more difficult problem presents itself. This problem has been more or less satisfactorily solved in a great variety of ways, but it will be sufficient to examine the three principal types or systems of breech-loading employed in modern artillery. They are popularly known as the Armstrong, the Krupp, and the French systems.

The Armstrong system is the earliest of these in point of date. In it a slot is cut through the top of the breech of the gun into the tube, and a breech block, through which the vent is driven, is dropped into this slot, and is pressed firmly against the bore from behind by the breech screw, which is provided with two powerful lever handles for the purpose. Where the breech block, or vent piece, as it is usually called, presses against the lip or bore, both surfaces are of copper, and are renewed from time to time as channels are worn through between them by the rush of the escaping powder gas. There are many guns, from six-pounders to seven-inch, made on this plan in the British service, and at the time of their introduction they constituted a great advance in gun construction.

In the Krupp system a slot is cut through both sides of the breech of the gun; in this slot, in the latest patterns, runs a cylindro-prismatic wedge, or, in other words, the round side to the rear. The flat side forms the bottom of the bore. For loading, the wedge is pulled out to the left side of the piece as far as the stop will allow it to go, the shell and cartridge are thrust up the gun from behind, the wedge is pushed in, and is pressed hard home and secured by an ingeniously-contrived screw with powerful handles. The end of the bore is enlarged, and into the recess thus formed fits a Broadwell ring, against which the face of the wedge abuts when forced home. The ring is so formed that it must always fit against the wedge, and be pressed firmly to it by the action of the gas on firing. This is accomplished by making the recessed surface of the gun and the exterior surface of the ring portions of a sphere. In spite of the theoretical perfections of the system, and the excellence of manufacture attained, it has always been found that after a time—after firing a very variable number of rounds—gas would begin to escape, and then speedily cut a channel between the ring and wedge. Krupp has fully recognized this, and has been successful in minimizing and localizing the injury thus caused.

A radical difference exists between the rifling of muzzle-loaders and that usually employed for breech-loaders.

When the projectile has to be pushed down the gun from the front, it must be smaller than the bore; when it is thrust home from behind, it may be rather larger than the bore.

GUNNERY. In its early days this science might have been simply defined as the art of determining the motions of projectiles discharged from pieces of ordnance; in its present state it includes also the employment of projectiles specially adapted to the purpose in view, and the manipulation of artillery so as to enable the projectiles to produce the maximum effect.

Instruments of great precision, mechanical construction of much accuracy, and a considerable knowledge of the higher mathematics are necessary to obtain and make use of trustworthy data for the establishment of sound principles on which to base the theory of gunnery. It is therefore not surprising that, owing to the early discovery of gunpowder, the art was long practiced in a rude manner, without any attempt being made to reduce it to a science. Thus, though firearms appear to have been in use from the early part of the fourteenth century, little of value was understood of the laws regulating the flight of projectiles till the time of Nicholas Tartaglia, who published a treatise on the subject at Venice in 1537. About sixty years before that date, Leonardo da Vinci had enunciated some of the mathematical principles of trajectories in a manner which shows him to have possessed far more insight than any of his contemporaries; but he did not pursue the inquiry, and Tartaglia may be regarded as the father of ballistics. Before his time it had been generally believed that a ball on leaving the bore of a gun proceeded for some distance in a straight path,—a fallacy which lurks in the phrase "point-blank," not yet expunged from popular speech. He saw, however, that "a piece of artillery cannot shoot one pace in a right line," and propounded the axiom that "the more swifter a pellet doth flie, the lesse crooked is his range,"—a truth expressed at the present day by the statement that a high velocity gives a flat trajectory. This eminent philosopher claimed the invention of the gunner's quadrant; he took into account in his calculations the resistance of the air, but placed the angle of elevation at which the maximum range would be obtained at 45° , which would only be the case *in vacuo*. Galileo was the next mathematician of note who investigated the subject. In his *Dialogues on Motion*, published in 1638, he recognized the resistance of the air, and pushed on the inquiry in the direction indicated by Tartaglia. It was not, however, till Newton's time that a substantial basis was laid down for a true theory of gunnery. The grand discovery of the law of gravitation revealed the hitherto unguessed secret of the projectile's fall to earth. Toward the end of the seventeenth century he investigated the trajectory of a projectile on the supposition that the resistance of the air varied as the first power of the velocity. Bernoulli in 1718 gave a solution of the problem, on the supposition that the resistance varied as any given power of the velocity. No further progress was made till Benjamin Robins in 1742 published his *New Principles of Gunnery*, in which he furnishes a notable example of the manner in which theory should be wedded to practice, and hypothesis to experiment. He invented the ballistic pendulum, and was the first to ascertain experimentally with any degree of correctness the velocities of projectiles on leaving a gun. The weight of Robins' first pendulum was fifty-six pounds, and it was therefore only suited for small arms. It could measure the velocity at only one point each round, and therefore, to ascertain the velocity lost by a ball in passing through the air, it was necessary to fire a series of rounds at one distance, and afterward a

similar series of rounds at another distance. Velocities of 1,700 feet per second were measured, and the loss of velocity due to the resistance of the air, up to a distance of 250 feet from the muzzle, was approximately ascertained. Robins discovered that the resistance of the air was greatly increased as soon as the ball traveled faster than sound, and attributed it to the creation of a vacuum behind the shot, into which the air could not rush with speed greater than that of sound. Count Rumford in 1751 made use of the recoil to measure the velocities of bullets, on the principle that the momentum of the bullet forward was equal to the momentum of the gun backward. To carry this out the gun was suspended as a pendulum, and the length of the arc it described on firing measured. By firing a bullet from a gun thus suspended into the ballistic pendulum, two independent records were obtained, and it would have been easy to calculate the loss of velocity, from the muzzle to any range at which the pendulum could be hit, by the combination. Doctor Hutton next took up the inquiry, and increased the weight of the pendulum and the bullets. No very great advance, however, seems to have been made till 1840, when experiments on the resistance of the air to the motion of spherical shot were carried on at Metz by the French Government. MM. Piobert, Morin, and Didion were the chief experimenters. They raised the weight of the receiving pendulum to nearly six tons, and fired into it fifty-pound balls at a range of 330 feet. The information now obtained spread over a much wider field than that traversed by Robins. It was even found possible to construct the trajectories of projectiles with some approach to truth, and empirical formulæ were laid down by which ranges and times of flight could be approximately calculated. It was not, however, till the introduction of electricity as a means of determining the velocities of projectiles that accurate knowledge of the resistance of the air was obtained. In 1840 Professor Wheatstone invented an instrument for this purpose, called the electro-magnetic chronoscope. He has had many successors, whose productions exhibit a great amount of ingenuity; those from which the most valuable results have been obtained, and which are in use at the present moment, are the Bashforth chronograph, the Noble chronoscope, the Le Boulengé chronograph, and the Watkin chronograph.

Projectiles.—The requirements of modern artillery have necessitated many complications in the preparation and use of projectiles, which now vary greatly in their nature and in the purposes for which they are employed. A general description of the several kinds supplied to European armies will be found under ammunition, and but few remarks will be required to connect them with the guns for which they are intended. Smooth-bored ordnance use solid round shot and case, common shell, and diaphragm shrapnel shell. Solid shot are used against masonry, wooden shipping and masses of men. They were at one time fired red-hot at shipping. Roughly, the cube of the diameter in inches multiplied by 0.133 gives the weight of the shot in pounds. Case shot consist of iron balls packed in iron or tin cylindrical cases. They are effective up to about 350 yards against troops, boats and rigging, and are especially suitable for flanking ditches. Common shell are completely filled with powder, and are burst in flight by time fuses, or, on striking, by percussion fuses. They are used against men in masses, buildings, works and material generally. Diaphragm shrapnel shell contain a small bursting charge and a number of balls. They are fitted with a time fuse which explodes the charge when they near the object, so that the released bullets fly forward.

The great advantage of rifling was long recognized in small arms and sporting pieces before it was extended to ordnance. The first rifled arms threw bullets which, except for certain projections designed to fit the grooves of the barrel, were spherical. These guns surpassed smooth-bore in accuracy, but it was not until the introduction of elongated projectiles that a distinct gain in power was recognized. The gain in accuracy is due in great measure to the superior correctness with which the ball is centered in the bore by the action of grooves, while the rotation imparted to it annuls or greatly lessens the disturbing effect of the pressure of the air on surface inequalities, or of variations in the position of the center of gravity. Thus, in addition to greater accuracy, rifling confers a flatter trajectory and greater penetration. The elongated form permits a head of the best shape, an increase in the contents of the shell, and the use of fuses which explode when the point strikes an object. The projectiles used with rifled guns are case shot, common shell, Shrapnel shell, and Palliser shell. The case shot differ little from those made for smooth-bore ordnance. Common shell are generally from two and a half to three calibers in length. They are designed to contain as much powder as possible, consistently with strength of wall to resist the shock of firing. Their effect is almost entirely due to explosion; velocity has little to do with it beyond conferring range and penetration. Common shells are generally fused with percussion fuses. The introduction of iron-clad ships is almost entirely due to the terribly destructive fire of shells. Shrapnel shell are filled with bullets, and have a bursting charge only sufficient to open the case and release the contents, which then fly forward with the velocity possessed by the projectile before breaking up. To get satisfactory results from time fuses it is necessary to have a gun which shoots with great regularity, a fuse composition which burns evenly, and an accurate mode of setting the fuse. Of late years improvements in powder and design of ordnance have rendered the velocities practically uniform. The fuse composition is somewhat liable to deterioration, but is tolerably satisfactory; and a new fuse auger has just been introduced which can be set to any desired degree of accuracy. As the power of Shrapnel shell is entirely due to the velocity possessed by the bullets when freed from the envelope, it is of paramount importance in long-range firing that the shell should start with a high velocity and retain as much of it as possible. With the more modern field guns the effective range of Shrapnel extends up to about 3,000 yards; with heavy guns, to 4,000 or even 5,000 yards.

Palliser shells are made of a mixture of selected brands of iron, and are cast in molds so constructed that the metal of the head is in contact with iron and that of the body with sand. The head is thus "chilled," as the rapid carrying off of the heat by the iron mold causes the particles of the metal to dispose themselves rigidly, and confers intense hardness, which property is essential for the penetration of iron plates. The greatest penetration of armor yet known was obtained by the eighty-ton gun at Shoeburyness in 1877. The target consisted of four eight-inch wrought-iron plates, sandwiched with three five-inch layers of teak, the whole put together with immense strength. The projectile perforated three plates and the teak, digging its nose about half way into the last plate, which was much cracked and bulged. The 100-ton gun has perforated with ease twenty-two inches of solid wrought iron plate, strongly backed, but failed to drive a hole through a similar target when the plate was of steel. Very recently extraordinary penetration has been obtained by a six-inch seventy-pounder made by

Sir W. G. Armstrong & Co. Fired with a velocity of nearly 2,000 f. s., this small projectile pierced about eleven inches of wrought iron. The subject of penetration is treated under GUNMAKING.

Guns were formerly primed with loose powder and fired by a match, next by common quill tubes filled with composition and ignited by a portfire, then by detonating tubes exploded by a hammer. Now friction tubes have superseded these methods for ordinary service. When it is desired to fire a gun from a distance, or to fire a number of guns absolutely at the same moment, Abel's electric tubes are employed.

The general principles guiding the employment and manipulation of artillery are applicable to the schemes of warfare of all civilized nations. The details of manufacture, the systems of loading and the methods of rifling, are the chief points regarding which artillerymen differ; these matters are treated under GUNMAKING. Of two pieces constructed with equal skill to perform the same kind of work, the heavier will always be the more powerful. Thus weight is the chief controlling element in the employment of guns, though cost and convenience of manipulation have often to be taken into account. The artillery of the present day is the outcome of a long series of improvements, and the whole system of this important arm bears traces of frequent modification and continual compromise. The first introduction of firearms appears to have taken place in England in the reign of Edward III. On the Continent it was probably somewhat earlier, but the actual date and the circumstances attending their introduction are involved in obscurity. It is said that cannon were used in the English expedition against Scotland in 1327, and at the battle of Crécy in 1346. In 1360 there were four copper guns in the Tower. For about two centuries cannon continued to be manufactured of copper, brass, or bronze, good castings of which were made long before the art of smelting iron ores was perfected. In the early part of the sixteenth century guns were sometimes made of wrought iron plates put together longitudinally and hooped with wrought iron. In 1545 cast-iron ordnance was manufactured in England, and supplanted pieces of all other materials for a time. The growing needs of warfare, however, soon demanded guns possessed of fair mobility to accompany armies in the field, and the cast iron pieces used being found excessively cumbrous, bronze was once again resorted to for field artillery. From about the middle of the seventeenth century till the introduction of rifled cannon, all the heavier species of ordnance—fortress, siege and ship guns—were made of cast iron; and all the lighter—field and boat guns—of bronze. In 1717 the bronze foundry was established at Woolwich, and most of the smooth-bored field pieces, howitzers and mortars used in the service were made there. The heavy cast iron guns were supplied by contractors, and proved by government officials. The long peace which succeeded the Napoleonic wars was highly unfavorable to the progress of gunnery, but a great development took place in the arts and sciences, so that, on the breaking out of the Crimean War, the latest discoveries in metallurgy and the excellence attained in machinery at once enabled inventors to make a great advance in artillery. At the transition period, a few wrought iron smooth-bores, throwing spherical shot of 150 and 100 pounds, were manufactured to overcome the resistance of iron plates then recently introduced for armoring ships. These pieces were speedily discarded for rifled guns; and practically it may be said that the adoption of steel and wrought iron for guns coincided with the change from smooth-bores to rifles, both steps of progress being thoroughly established about 1860. In

spite of the great superiority of the new ordnance, it cannot be said that the old pieces are yet superseded; vast numbers of them exist over all parts of the world, and often form the only defense. Even the fortifications in England are still largely armed with them on land fronts; and though they are gradually disappearing, they yet claim notice. Bronze guns are now obsolete in the British service. Those denominated according to the weight of their projectile are made strong enough to fire solid shot or shell; those called by the diameter of the bore fire shell only. It must be remembered that, with spherical projectiles, the solid must be heavier than the hollow kinds, which need not be the case with rifled ordnance, as the projectile may be of any length. The guns are used for direct fire, the howitzers for curved fire, the mortars for vertical fire *i.e.*, they are set at 45° elevation, and the requisite range attained by varying the charge of powder, instead of firing at various degrees of elevation, as with guns and howitzers.

The old field smooth-bores were fairly effective up to 1,000 or 1,200 yards, and so established a great superiority over the smooth-bored musket; but as soon as the rifled musket was generally adopted, an advance in artillery power became necessary if the arm was to retain its position in the scale of efficiency. After the Crimean war, Napoleon III. rifled his bronze field guns on Treuille de Beaulieu's system, and the new pieces exhibited great merit at Magenta and Solferino in 1859. England, and indeed every European power, was busily engaged in experimenting during this period. The early Armstrong guns in England, Broadwell's and Krupp's in Prussia, and imitations of the French plan in other countries, speedily caused field artillery to regain its place in war. The northern kingdoms of Denmark and Norway and Sweden, favored by specially good iron ores, and free from the immediate alarm of war, retained cast iron as the material for light ordnance. Prussia had already begun to use steel for smooth-bores, and naturally adhered to it for rifled guns, while the coil system brought forward by Armstrong was found cheap and enduring in England. The new Prussian guns were breech-loaders, constructed on the double-wedge system; they proved unsatisfactory, and since the Franco-Prussian war of 1870-71 have been abandoned in favor of a single-wedge system of great neatness and efficiency. The Armstrong guns were also breech-loaders, and when tested by land and sea, on actual service in China, New Zealand, and Japan, proved to be very powerful when compared with the old smooth-bores, but also exhibited many defects of construction. At this time no thoroughly successful breech-loader had been invented, and England reverted to muzzle-loading, while the Continental powers for the most part endeavored to improve their methods of breech-loading. England's field artillery was undoubtedly the most powerful known at that period. No one was more alive to this fact, or more dissatisfied with it, than the Germans. Their great gunmaker, Krupp, forthwith improved his breech-closing fittings, and instituted series upon series of experiments till he produced two guns—one for horse artillery, and one for field batteries, also horsed—which were an enormous advance on the weapons previously employed against the French. The lighter gun weighs seven hundred weight, and throws a shell of eleven pound weight, with a muzzle velocity of 1,525 feet per second; the heavier weighs nine hundred weight, and throws a shell of seventeen-pound weight, with a muzzle velocity of 1,460 feet per second. These are figures indicating power not to be attained by the English eight hundred weight gun, or even the newer pattern of six hundred

weight, throwing a nine-pound shell with a muzzle velocity of 1,380 feet per second, and the twelve-hundred weight gun, throwing a sixteen-pound shell with a muzzle velocity of 1,360 feet per second. The immediate consequence of the introduction of these improved German pieces was the instituting of a series of experiments in England which resulted in the production of a muzzle-loading field gun, weighing eight hundred weight, throwing a thirteen-pound projectile with a muzzle velocity of 1,560 feet.

Important as are the land-service pieces of the army to England, yet, viewing her naval supremacy as one of the chief sources of her greatness, we must consider heavy ship and coast-defense ordnance to take the first place in modern gunnery. The contest between guns and armor has now continued with scarcely any intermission for upward of thirty years, during which time the armor was increased in thickness from four to twenty-four inches, and the guns from 68-pounders to 2,500-pounders; that is, from the most powerful of the old cast-iron smooth-bore to the one-hundred-and-ten-ton gun. The first armor-piercing rifled guns were the seven-inch Armstrong breech-loaders, but their supremacy was of short duration. They were the heaviest made on that system, and were speedily succeeded by far more powerful muzzle-loaders. In 1867 eight-inch and nine-inch guns had already been introduced. The nine-inch Woolwich rifled gun of twelve tons was tried in competition with the fifteen-inch American smooth-bore, which weighed nearly half as much again, against armor. The British piece gained a decisive victory. In 1868 it was decided to introduce a ten-inch gun of the same character. Since that time progress has been continual. For a full account of modern productions in the line of heavy ordnance, see article on ARTILLERY.

The development which has taken place of late years in the power of artillery has necessitated corresponding changes in gun carriages. Formerly, every carriage was capable of traveling to some extent; even the heaviest guns were mounted on carriages fitted with trucks, which permitted motion on the ramparts or about a deck. Later on, sloping traversing platforms were introduced, up which the gun carriage recoiled on firing. Extra means of checking recoil became necessary as the power of the guns grew; compressors, or friction plates were introduced, and are now only partially superseded by the hydraulic buffer. Mobility of carriage has almost entirely been given up, except for field and mountain artillery. The heavier siege guns travel on platform wagons, not on their firing carriages; and it is possible that the traversing platform and slide principle will extend yet further.

Several kinds of carriages on the "disappearing" principle have from time to time been put forward. In these the gun is exposed to the fire of the enemy only while being aimed and discharged; loading is performed under cover. The Moncrieff carriages are the most successful of this class. In them the force of recoil is stored up, and employed to raise the gun from the loading to the firing position. The counter-weight carriages are used to some extent in coast defense, and the hydro-pneumatic carriages are under trial for siege-train guns. As soon as the weights of ordnance increased so greatly that their service exceeded the power of manual labor, it became necessary to find some substitute. Steam power is always at hand in steam vessels, and it was quickly seen that it was best applied through the medium of water pressure. The simplicity and compactness of hydraulic machinery, the circumstance of its direct action rendering toothed gear unnecessary, and the perfect control it gives over the motion of heavy weights, especially adapt it for the purpose.

Many other applications of hydraulic power to gunnery besides those just described are due to Mr. G. Rendel of the great Elswick firm. One of the most novel is that adopted in H. M. S. *Téméraire*, in which twenty-five-ton guns are mounted on the disappearing principle in a turret having no roof and no ports; inside the turret is a turn-table carrying the gun by the trunnions on two arms, which are raised by hydraulic power, enabling the gun to fire *en barbette* over the wall of the turret. The recoil brings it down again, and it is placed opposite the loading gear by revolving the turn-table. The general principles are the same as those on which the previously described systems are constructed.

This article would be scarcely complete without a reference to the comparative advantages of the muzzle and breech-loading systems. Many have been much impressed with the great superiority of breech-loaders as small arms, whether for sporting or military purposes, and have concluded that the same superiority must extend to ordnance constructed on this plan. Others, having seen the difficulty of avoiding complication and accident to the parts in the early breech-loaders, have hastily condemned the whole system. The truth as is often the case, lies between the two views, as will be seen from the following considerations. The chief points of excellence to be attained by a field gun are—(a) high ratio of power to weight; (b) immunity from injury by its own fire; (c) immunity from injury by the enemy's fire; (d) capability of supporting the accidents of service; (e) rapidity and facility of manipulation; (f) efficiency of projectile. (a) The power of a gun is most conveniently measured by the energy (in foot tons) communicated to the projectile on leaving the muzzle.

GUNNY. This name is applied to cloth or bags made of jute, and is supposed to be derived from *ganga*, or *ganja* of Rumphius, or from *gonia*, a vernacular name of a plant common in Madras.

The seeds of the jute plant are sown in April or May, and the plant is cut down close to the roots just before flowering. The tops are then clipped off and the stems made into bundles, which are placed in tanks or ditches and covered with turf or other heavy substances to keep the bundles under water. Here they are watched anxiously day by day till the fiber separates easily from the central woody portion. The period of retching or soaking takes from eight to ten days; if allowed to remain too long, the fiber rapidly decays. In drying also the fiber generally becomes of a deeper color. When the fiber is ready for manipulation, the operator descends into the tank or ditch, and taking ten to fifteen bundles, strips off the barky fiber and washes thoroughly, and by a dexterous movement of the wrist spreads and separates the fibers over the surface of the water. The fiber soon becomes clean, and is hung over bamboo framework to dry. The fiber thus obtained is fine, long and silky, but the short staple and the portion near the root held in the hand of the operator during washing, which frequently has bark attached, are the portions generally selected to make gunny bags or cloth of.

The kind of cloth known as gunny, tat, choti, etc., is woven in various length and widths for use as bedding, bags, etc., and formerly, more than at present, every man, woman, and child, boatmen, husbandmen, and others, in their spare moments, distaff in hand, wove gunny cloth. On the eastern frontier women are clothed in it, and the poor cover themselves with it at night. In the Malayan Archipelago it is no unusual sight to see a poor Chinese coolie with a dress made of gunny cloth. The great and most important use, however, to which gunny cloth is applied is in making bags wherein to pack rice, linseed, sugar, cotton and other products for shipment.

As soon as this cheap, strong, and serviceable material became known, the manufacture speedily assumed enormous proportions, and vast quantities of jute were imported into Dundee for the manufacture of gunny bags and cloth alone. The Dundee mills, in the early period of this trade, had only Indian hand-woven gunnies to compete with. The introduction of the latest machinery of the most approved patterns into Bengal, the chief seat of this industry in India, has, however, had the effect of giving India the opportunity of competing with the Dundee mills on advantageous terms, and now India supplies vast quantities of gunnies to Europe, Egypt, Ceylon, the Malayan Archipelago, China, and the United States. In America alone it is computed that the annual average outturn of cotton is 3,500,000 bales, each bale requiring six yards of wrapping material and of this one-third at least is supplied in gunny cloth.

GUNPOWDER. Upon the great importance of the invention of gunpowder it is needless to dwell. Not only has it revolutionized the art of war, and given the forces of civilization a vast advantage over mere numbers and savage valor, but we may even urge, paradoxical though it appears, that the very improvements by which modern science has rendered military machines more deadly tend to make war far more expensive, and therefore to prevent its being so frequently or so rashly undertaken as of old. Besides such indirect services to civilization, gunpowder has been and is of great use in the arts of peace, although of late years to a certain extent superseded by more potent explosive agents.

Such being the case, it is not a little remarkable that the discovery of gunpowder should be veiled in uncertainty, although this very obscurity seems proof of its great antiquity. It is, however, certain that it was not invented, as has been often stated, by the German monk Bertholdus Schwartz, about 1320, although Wilkinson, in his *Engines of War*, considers Schwartz may have suggested the use of a mortar, since the form as also the name of this piece of ordnance may well have been due to some accident in the laboratory. Roger Bacon, who was born in 1214, refers, *circa* 1267, to an explosive mixture of the nature of gunpowder as known before his time, as being employed for purposes of diversion, and as producing a noise like thunder, and flashes like lightning; he even suggests its application to military purposes, and indulges in the supposition that some such composition might have been employed by Gideon to destroy the Midianites. Marcus Græcus, who lived about the end of the eighth century, was not ignorant of the military uses to which the composition might be put; among other modes of launching fire upon an enemy he gives one to the following effect:—one pound of live sulphur, two of charcoal of willow, and six of saltpeter, reduced to a fine powder in a marble mortar and mixed together; a certain quantity is to be put into a long, narrow and well compacted cover, and then discharged into the air. This is evidently the description of a rocket. It has also been suggested that Bacon may have learnt the secret in Spain, in which country he is known to have traveled, and whose Moorish masters were then far in advance of the rest of Europe in science and literature. There is a treatise on gunpowder in the library of the Escorial, written about 1250, which appears to describe both rockets and shells; the Arabians are, from this and other authorities, supposed to have enclosed combustible or explosive compositions in hollow globes of iron, which were discharged upon the foe either by hand, like the modern grenade, or from the warlike machines then in use; it has also been stated that toward the close of the thirteenth century they projected small balls from tubes carried in the hand, or attached to the end of a lance, and only used at close

quarters, being in fact hand-guns. Rockets were employed during the reign of the Greek Emperor Leo, about 880, and indeed seem to have been known in India from time immemorial, some of them having been made of great size.

The gloom of the dark ages precludes further attempt to trace back the history of gunpowder with any certainty.

It is almost certain that those authors who assert that the Arabians used gunpowder at the siege of Mecca, 690 A.D., having derived their knowledge of it from India or China, confound gunpowder with Greek fire, which seems to have been the generic name, given to several different combustible mixtures, although Arabian writers speak of them as Chinese fires. Greek fire was introduced into Constantinople from the East about the year 673; it was discharged upon the enemy by means of various engines of war, or in smaller quantities attached to arrows or darts. The Saracens used it against the Crusaders.

However, its actual destructive effect seems to have been very inadequate to the terror it occasioned. From the account of Geoffrey de Vinesauf, sand and earth, but especially vinegar, appear to have been considered the best extinguishers; water would not put it out. One description of this wildfire was composed of resin, sulphur, naphtha, and probably saltpeter. Bacon states that religious scruples hindered European nations from adopting Greek fire; but if so, they seem to have been gradually overcome, for its use is mentioned by various writers, Anna Comnena, Père Daniel, and Froissart among them.

The researches of all authorities seem to point to the far East as the birthplace of an explosive mixture of the nature of gunpowder; it was used there from time immemorial, although doubtless its application as a propelling agent is of far later date. In all probability, the germ of the science of explosives lay in the accidental discovery of the peculiar properties of the niter so plentifully found mixed with the soil upon the vast plains of India and China. By means of the charred embers of wood-fires, used for cooking, the two most active ingredients of gunpowder might easily be brought into contact, and, under the action of heat, more or less deflagration would ensue; in fact, the accidental dropping of some of the crude saltpeter into the coals would show its remarkable power of supporting and accelerating combustion. The combination of saltpeter and charcoal in a more or less powerful mixture can therefore be easily conceived, the sulphur being an after addition, and not necessary to cause explosion. Our present gunpowder is only the improvement and perfection of such a mixture. Saltpeter was early known as "Chinese snow," and some have supposed the use of gunpowder in cannon to have been known in China very soon after, if not before, the Christian era. But this seems to be an error, for Colonel Anderson, C. B., in his book on gunpowder (London, 1862), quotes a conversation held by John Bell of Antermony, who visited Peking in 1721, with the emperor's general of artillery, to the effect that from their records it had been used in fireworks, etc., for about 2,000 years, but that its application to the propulsion of shot was a late introduction. Some of their compositions had such names as "devouring fire," "earth thunder," etc. The *Institutes of Timur*, written about the middle of the fourteenth century, contain no mention of cannon or gunpowder, although full particulars are given of the equipment of his troops; it is, however, related that when Timur engaged the army of Mahmud under the walls of Delhi, men scattered wildfire and flung rockets in every direction.

Whatever obscurity may hang over the early history of gunpowder, it seems most probable that its employment as a propelling agent originated among the Moors or Saracens — whose civilization for several centuries contrasted forcibly with the intellectual darkness of Christendom — and from them spread eastward, as well as northward into Europe. The first reliable contemporary document relative to the use of gunpowder in Europe, a document still in existence, bears date February 11, 1326; it gives authority to the priors, the gonfalonier, and council of twelve of Florence to appoint persons to superintend the manufacture of cannon of brass, and iron balls, for the defense of the commune, camps, and territory of the republic.

If the testimony of John Barbour, archdeacon of Aberdeen, who wrote in 1375, is to be believed, cannon, which he calls "crakys of war," were employed during the invasion of Scotland by Edward III. in 1327; but they are not mentioned in the accounts of the expenses of this war preserved in the record office. From the year 1345, 19 Edward III., we have, preserved in the record office, reliable accounts of the purchase of ingredients needed for the fabrication of gunpowder, and of the shipping of cannon for France. In 1346 Edward III. ordered all the saltpeter and sulphur that could be found to be bought up for him, but the quantities obtained were very small. Whether it be true or not that cannon were used by the English at Crécy in that year belongs rather to the question of the employment of artillery in the field; it has been maintained that such was the case by Napoleon III.

In the year 1377, being the first of Richard II., Thomas Norbury was ordered to buy, among other munitions, sulphur, saltpeter, and charcoal to be sent to the castle of Brest. In 1414 Henry V. ordered that no gunpowder should be taken out of the kingdom without special license; in the same year this monarch also ordered twenty pipes of powder made of willow charcoal, and various other articles for the use of the guns.

It was not, however, until the reign of Elizabeth that the manufacture of gunpowder can be said to have been established in England. The greater portion required had been previously imported from abroad, and the trade had been an open one; but the threatening attitude of Spain compelled the government to provide more efficient means of defense, and patents were issued by the crown for the manufacture of gunpowder, constituting it a monopoly. Early in this reign also, saltpeter began to be artificially produced in England, but the quantity so obtained formed a very small proportion of the supply needed, the remainder being brought from various parts of the Continent, and from Barbary. Again, in 1623, nominally in order to prevent the sale of weak or defective powder, a proclamation was issued by James I., prohibiting its manufacture, as well as that of saltpeter, except under the king's commission, and directing that all gunpowder should be proved and marked by the sworn proof-master. A little later, in 1626, the East India Company had commenced the importation of saltpeter, and had also erected powder works in Surrey. Their renewed charter in 1693 contained a clause providing that 500 tons of saltpeter were to be furnished to the ordnance annually, and from this time forward we hear of no difficulty, at least in England, of obtaining the chief ingredient of gunpowder, although on the Continent great attention has been paid to its artificial production; this was especially the case in France during the reign of Napoleon I., when the supremacy of Great Britain at sea for many years prevented the importation of saltpeter by her enemies.

About the year 1590, George Evelyn, grandfather of

the celebrated John Evelyn of Wootton, received the royal license to set up powder mills at Long Ditton and Godstone; the Evelyns are said to have brought the art from Holland. The works at Faversham, afterward for so many years the government gunpowder factory, date from Elizabeth's reign, but were then of secondary importance to those at Godstone. There seems reason, however, to suppose that powder mills existed at Waltham Abbey so far back as 1561. The Waltham Abbey works have been greatly enlarged of recent years, and no expense has been spared to render them, by the introduction of new and improved machinery, the most complete as well as the safest in the world.

The earliest gunpowder used in cannon in Europe consisted of equal parts of saltpeter, charcoal and sulphur, ground up and mixed together as required. To account for the use of such a very weak composition long after better proportions had been ascertained, it must be remembered that the earliest cannon were composed of iron staves roughly hooped together; and tubes of thin iron, or even of wood or leather, with rope coiled round them, were sometimes used. Indeed, the effective application of gunpowder as a propelling agent involves a whole series of inventions, and it was doubtless chiefly owing to the backward state of mechanical science during the Middle Ages that such weak powders were employed. The slow growth of artillery science in Europe for five centuries, and its rapid development in very recent years, are facts which support this presumption. Even about 1410 the proportions were still but three saltpeter, two sulphur and two charcoal. The relative amount of saltpeter was gradually increased, and Tartaglia (*Quesiti e Inventioni diversi*, Venice, 1546) mentions twenty-three various compositions as having been used at different times.

It is remarkable that Robins states the above proportions to have been very nearly those of his own day (1742), for there is a great deficiency of saltpeter in the cannon powder, and a considerable excess in that for muskets, compared with the relative qualities now employed in England. For a long period of time it was the custom for the fine grain or musket powder to contain a larger proportion of saltpeter than that for cannon; and, again, the amount of the niter was relatively reduced as the piece of ordnance became heavier, doubtless with the view of obtaining a slower burning powder for large charges. However, we find that by the latter part of the last century, what was called "common war powder" was almost universally composed of six saltpeter one charcoal and one sulphur, and these are the proportions still in use by many Continental nations.

The following table gives the percentage composition of gunpowder as now made in different countries for military purposes:

	Saltpeter.	Charcoal.	Sulphur.
England, Royal Gunpowder factory.....	75	15	10
France.....	75	12.5	12.5
Germany.....	76	14	10
Austria.....	76	14	10
Russia.....	75	15	10
Belgium.....	75	12.5	12.5
Spain { Cannon powder.....	75	15	10
{ Rifle.....	75	12.5	12.5
United States.....	75	12.5	12.5

The best sporting powders have about the same composition as those made by Government. Wherever cheapness is the chief object in view, the quantity of

iter is diminished, and the other two components relatively increased. Some of the powder for the African trade, commonly called "nigger powder," does not contain much more than 50 per cent. of saltpeter, while other kinds are nearly as bad. Blasting powder contains a low proportion of saltpeter, from 60 to 62 per cent., but, although this reduction may originally have been made in order to manufacture a cheaper article, yet it is also the most effective for the object desired in many cases, which is to remove large masses of earth or soft rock, and this can best be done by using a comparatively weak or slow-burning powder. The element of time is here of great importance; a very quick-burning or violent explosive would not displace such large masses of a soft material, although the local effect would be more destructive.

GUNPOWDER PLOT. See **FAWKES**.

GÜNS (Hungarian, *Köszeg*), the second town in importance of the Hungarian megye or county of Vas (Eisenburg), near the Styrian frontier, is situated on the Gyöngyös. It is the see of a bishop, and from 1648 until the recent administrative changes of 1876 was a royal free town. Population about 8,500.

GUNSHOT WOUNDS. Although excessive bleeding is not so common after gunshot as other kinds of wounds, it may occur immediately to a fatal extent, if assistance be not afforded. This assistance any one can give. It consists simply in placing the fingers in the wound, and if the vessel can be reached, pressing them upon it, directed to the proper point by the warm gush of blood. Should the wound be too small to admit the finger, a handkerchief may be tied around the limb above the wound, and twisted tightly with a stick. It is well to examine the wound, to ascertain the extent of the injury done, and whether there are splinters of bone or portions of dress lying in it. If so, they should be removed. But neither the examination nor the removal should be attempted if they seem likely to aggravate the injury. The treatment is similar to that of other wounds, and consists in protecting the part during the healing stages, moderating inflammation by cold-water dressings or soothing poultices, and hastening the last stages of cure by stimulating lotions.

GUNTER, EDMUND, was born in Hertfordshire in 1581. He was educated on the royal foundation at Westminster school, and in 1599 was elected a student of Christ Church, Oxford. After graduating bachelor and master of arts at the regular times, he took orders, became a preacher in 1614, and in November, 1615, proceeded to the degree of bachelor in divinity. Mathematics, however, which had been his favorite study in youth, continued to engross his attention, and on March 6, 1619, he was appointed to the professorship of astronomy in Gresham College, London. This post he held till his death, which took place on December 10, 1626. With Gunter's name are associated several useful inventions, descriptions of which are given in his treatises on the *sector, cross-staff, bow, quadrant, and other instruments*.

Gunter's Chain, the chain in common use for measuring land, is twenty-two yards long and is divided into 100 links. Its usefulness arises from its decimal or centesimal division, and the fact that ten square chains make an acre.

Gunter's Line, a logarithmic line, usually laid down upon scales, sectors, etc. It is also called the *line of lines* and the *line of numbers*, being only the logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms do arithmetically.

GÜNTHER, JOHANN CHRISTIAN, German poet, was born at Striegau in Lower Silesia, on April 8, 1695. He entered in 1715 the university of Wittenberg with the view of studying medicine; but he became idle and dissipated, contracted heavy debts, and came to a complete rupture with his father. In 1717 he went to Leipsic, where he obtained the friendship of Menck, and published a poem on the peace of Passarowitz, which acquired him an immediate reputation. Merck recommended him to the king of Poland, but unhappily the first time he appeared at court he was in a state of intoxication. From that time he led an unsettled and dissipated life, depending for an uncertain subsistence partly on money obtained for occasional poems and partly on the charity of his friends. He died at Jena, March 15, 1723, when only in his twenty-eighth year. Goethe pronounces Günther to have been a poet in the fullest sense of the term.

GUNTOOR, a town in Kistna district, Madras, situated on the Grand Trunk road, about forty-six miles from Masulipatam. Population, 18,033.

GURDĀSPUR, a British district in the lieutenant-governorship of the Punjab. Few facts can now be recovered with regard to the early annals of Gurdāspur. Our first distinct historical knowledge begins with the rise of the Sikh confederacy. The whole of the Punjab then was distributed to the chiefs who triumphed over the imperial governors. In the course of a few years, however, the famous Ranjit Singh acquired all the territory which those chiefs had held. Pathānkot and the neighboring villages in the plain, together with the whole hill portion of the district, formed part of the area ceded by the Sikhs to the East India Company after the first Sikh war in 1846. In 1861-62, after receiving one or two additions, the district was brought into its present shape, having its headquarters at Gurdāspur. Area 1,822 square miles; population about 1,000,000.

GURGAON, or **GOORGAON**, a British district in the lieutenant-governorship of the Punjab. In 1803 Gurgāon district passed into the hands of the British after Lord Lake's conquests, and under their influence improvements made steady and rapid progress. On the outbreak of the mutiny of Delhi, in May, 1857, the nawāb of Farrukhnagar, the principal feudatory of the district, rose in rebellion. The Meos and many Rājput families followed his example. A faithful native officer preserved the public buildings and records at Rewāri from destruction; but with this exception, British authority became extinguished for a time throughout all Gurgāon. After the fall of the rebel capital, a force marched into the district and either captured or dispersed the leaders of the rebellion. The territory of the nawāb was confiscated on account of his participation in the mutiny. Civil administration was resumed under orders from the Punjab Government, to which province the district was formally annexed on the final pacification of the country. Area, 2,500 square miles. Population over 700,000.

GURNALL, WILLIAM, author of the *Christian in Complete Armour*, was born in 1616 at Lynn, Norfolk-shire. He was educated at the free grammar school of his native town, and in 1631 was nominated to the Lynn scholarship in Emmanuel College, Cambridge, where he graduated B.A. in 1635, and M.A. in 1639. Nothing is known of his history from the time that he left the university till 1644, when he was made rector of Lavenham in Suffolk; but it would appear from one of his letters, that when he received that appointment he was officiating as minister of Sudbury. At the Restoration he signed the declaration required by the Act of Uniformity, and on this account he was the subject of a libelous attack, published in 1665, entitled

Covenant-Renouncers Desperate Apostates. He died October 12, 1679, and was buried at Lavenham.

GURNARD (*Trigla*). The gurnards form a group of the family of "mailed cheeks," and are easily recognized by three detached finger-like appendages in front of the pectoral fins, and by their large, angular, bony head, the sides of which are protected by strong, hard, and rough bones. The pectoral appendages are provided with strong nerves, and serve not only as organs of locomotion when the fish moves on the bottom, but also as organs of touch, by which it detects small animals on which it feeds. Gurnards are coast-fishes, generally distributed over the tropical and temperate area.

GURWAL. See **GARHWAL**.

GUSTAVUS I., king of Sweden, commonly known as **GUSTAVUS VASA**, the surname being derived from the family arms, which were a bundle of sheaf, is justly celebrated as the founder of modern Sweden; he delivered it from the yoke of Denmark, introduced the Reformation, established law and order, and laid the foundation of its industrial prosperity. His family name was Ericson; he was born about 1496 of a noble house; and he was related to the powerful family of Sture. Gustavus was at a very early age called upon to suffer for his country. Sweden was still joined to the other Scandinavian kingdoms under the union of Calmar, Denmark being the leading state. Sweden was a reluctant member of this union, and King Christian of Denmark was obliged to maintain his supremacy with a high hand. In an expedition to Stockholm this king treacherously carried off the young Gustavus and other nobles as hostages to Denmark. After being detained in Jutland for above a year, Gustavus managed to escape in disguise to Lübeck, and the great Hanse town, ever jealous of the power of Denmark, furnished him with the means of returning to Sweden, where he landed in 1520. He had now formed the resolution to deliver his country from the oppression of the Danes. He went about from place to place trying to incite the people to revolt, but on all hands he met with apathy and even resistance. For some time his life was in extreme danger; he was hunted by the Danish authorities, and worked in disguise on the farms and in the mines of Delecarlia. The barn in which he threshed corn is preserved as a state monument. He was on the point of fleeing over the hills into Norway, when tidings came of the Blood-bath of Stockholm, in which ninety of the nobles and leading men of Sweden, including the father of Gustavus himself, were executed by the Danish king. This deed roused the slumbering patriotism of the Swedes, especially of the hardy people of Dalecarlia, who now chose Gustavus as their leader (1520). They repeatedly defeated the Danish forces, and took the principal towns. By 1523 Stockholm was taken, and Sweden delivered from the Danish yoke. At a great diet held at Strengnas in that year Gustavus was elected king of Sweden. Finland was speedily recovered. After liberating his country, Gustavus set himself to the far harder task of reforming and settling it. Sweden was in a very backward and disorderly condition. The nobles had great power and many selfish privileges; the clergy were wealthy, and in the war of freedom had taken the side of the Danes; the peasants were poor and discontented. There was little respect for law; the whole country was demoralized and disorganized. The reforms of Gustavus began with the church. The two brothers Peterson had already introduced the doctrines of Luther, and the chancellor, Anderson, had translated the New Testament into the native tongue. Vasa encouraged their efforts; in a great diet held at Westeras, in 1527, he succeeded, under the threat of abdicating, in passing measures by which the lands of the bishops were placed

at his disposal, and full liberty was granted of preaching the gospel; but the support of the nobles had to be gained by a share of the spoils. The Reformation soon took deep root, but the troubles of Gustavus continued. He required to deal with a turbulent nobility; he had to beat off the exiled king of Denmark; thrice he needed to pacify a revolt in Dalecarlia; and he was forced to put forth the whole strength of his kingdom to quell a peasants' war in the south. The pretensions of Lübeck, which had given him real help in the war of freedom, and to which he owed a considerable sum of money, involved him in a war, by which he curtailed their commercial privileges. In all these difficulties Gustavus bore himself with equal energy and wisdom. In 1544 his position was so secure that the elective sovereignty was changed by the diet into an hereditary one. From this time till his death in 1560, except an unimportant war with Russia on the Finnish frontier, there was little to disturb the quiet progress of Sweden. Gustavus' home policy made an era in Swedish history. Law, order, and national spirit were encouraged and developed; schools were everywhere established, roads made, and foreign trade extended by advantageous commercial treaties with England and Holland. While he avoided a foreign war he did not neglect national defense; he left an excellent army of 15,000 men, and he created a considerable naval force. Altogether, few kings have done so much for any country as Gustavus Vasa did for Sweden. He was succeeded by his son Eric.

GUSTAVUS II., or **GUSTAVUS ADOLPHUS** (1594-1632), the hero of Protestantism in the Thirty Years' War, and the first king of Sweden who played a great rôle in European history, was the grand-son of Gustavus Vasa, and the son of Charles IX. He was born at Stockholm in 1590, and received an excellent education. As we learn from his friend and chancellor Oxenstierna, he gained in his youth "a complete and ready knowledge of many foreign languages, so that he spoke Latin, German, Dutch, French, and Italian as purely as a native, and besides had some foretaste of the Russian and Polish tongue." Even during his busier years, after ascending the throne, it is said that he was fond of reading the great work of Grotius, *De Jure Belli et Pacis*; also that he knew Greek, preferring Xenophon as a military historian to any other. He was introduced to the business of government at an early age; when he was only ten, his father required his presence at meetings of council and at the audiences given to foreign ambassadors. This early experience was needed, for, his father dying in 1611, he ascended the throne of Sweden in his eighteenth year. His position was a difficult one; after fifty years of civil strife, Sweden had lost the strong and compact organization which it had received from Gustavus Vasa; the finances were exhausted, the nobles were discontented, and the spirit of the people had declined. Abroad, Sweden was surrounded with enemies, Denmark, Russia, and Poland being in a state of chronic hostility with it.

To the difficult task before him the young king applied himself with equal skill and resolution. The administration was reformed in all its branches, industry encouraged, and education greatly improved. In this way the national spirit was wonderfully raised; and Sweden was gradually prepared to play for the first time a great part in Europe — a part which seemed so disproportionate to her natural resources. At his accession Gustavus was engaged in a difficult war with Denmark, which, besides its supremacy over Norway, occupied what is now southern Sweden. The peace of 1613 left their respective frontiers very much as they had been before the war. The war with Russia ended much more advantageously for Gustavus in the peace of Stolbova

(1617), by which Sweden was confirmed in the possession of the Baltic provinces stretching from Finland to Livonia. Gustavus clearly foresaw the advantage to Russia and the danger to Sweden if the former power were allowed to plant itself on the Baltic coast; and he now congratulated his country on a peace which assured her against such a risk. In 1620 Gustavus married a sister of the elector of Brandenburg, with whom he lived happily till his death. After being for many years engaged in an intermittent war with Poland, Sweden (1621) entered upon a more active conflict with that power, which lasted till 1629. Sigismund, king of Poland, was his cousin, and had at one time been king of Sweden, but had been forced to resign owing to his Catholic opinions. He still laid claim to the crown of Sweden. In this war Gustavus took Riga, and made many other conquests in Livonia as well as in Courland and Prussia, part of which he retained by the peace of Altmark, concluded under the mediation of Richelieu.

While Gustavus had been involved in his Baltic war, the Catholic house of Austria had been swiftly raising itself on the ruins of German Protestantism to a position of absolute supremacy. In this early period of the Thirty Years' War, which dates from 1618, the armies of Protestantism had been everywhere overthrown by Tilly and Wallenstein. The latter, raising a host at his own cost and bearing desolation wherever he went, garrisoned Brandenburg and Pomerania, occupied Mecklenburg, and overran the continental dominions of Denmark. The only town that successfully resisted the imperial general was Stralsund; the king of Denmark was obliged to make peace. Such a colossus, with its gigantic force of oppression and devastation and its invincible armies, Gustavus now ventured to attack. It seemed a foolhardy undertaking which excited the laughter of his enemies, when in midsummer, 1630, he landed on the coast of Pomerania with his little army of 15,000 men. Yet there were many things in his favor—the despair of the Protestant princes, who saw a great part of their lands threatened by the edict of restitution; the disunion of the Catholics, who forced the emperor to dismiss Wallenstein shortly after the landing of Gustavus; the help of Richelieu, who now inaugurated the French policy of weakening Germany by dividing it. This help was formally assured him by the treaty of Bärwalde (January, 1631). Yet the German princes showed no haste to join Gustavus; the duke Boguslav reluctantly consented to receive the Swedish army into his capital—Stettin. But the marvelous discipline of the Swedes, so different from the wild barbarism of the imperial army, soon gained the confidence of the German people; robbery and license were unknown; morning and evening the soldiers assembled for prayer round their regimental chaplains; such an army had never been seen in Europe. It was not less distinguished for its hardy bravery in war; keeping the field in winter as well as summer, it soon drove the imperialists out of Pomerania and the lower basin of the Oder, and stormed Frankfort-on-the-Oder. In the midst of those successes, Gustavus was greatly moved by the sack of Magdeburg (May, 1631). Fearful of being cut off from his base of operations, he could not advance to the relief of the city without the coöperation or consent of the electors of Brandenburg and Saxony. During the delay thus caused, Magdeburg was taken by Tilly, and became a scene of the most fearful atrocities. Too late Gustavus forced the elector of Brandenburg to hand over to him the fortresses required; a desolating invasion of Saxony by Tilly compelled even the Saxon elector to seek the aid of Sweden. The union of the Swedish and Saxon forces was followed by the battle of Breitenfeld (near Leipsic), in which

Tilly was completely overthrown, and the supremacy of Catholic Austria shattered at a single blow (September, 1631). While the Saxons overran Bohemia, Gustavus, now hailed as the liberator of Protestantism, marched westward toward the Rhine, gathering round him the friendly Germans, and driving out the imperial garrisons. Würtzburg and Frankfurt were occupied; at Oppenheim he forced the passage of the Rhine against the Spaniards; he spent Christmas in the ecclesiastical city of Mainz. Early next spring he advanced into Bavaria, forcing the passage of the Lech in the face of Tilly (who was mortally wounded). Munich had to pay a war contribution to the Swede.

In this overwhelming reverse of fortune, the emperor Ferdinand was obliged to invoke the aid of Wallenstein, who soon changed the course of the war. He gathered a mighty host, cleared the Saxons out of Bohemia, and, marching westward, threatened the wealthy city of Nuremberg. Afraid of a repetition of the horrors of Magdeburg, Gustavus hastened northward, and threw himself into the city with a small force. In the neighborhood Wallenstein threw up a fortified camp, resolving to starve his rival out; and here the great captains watched each other for several weeks. After drawing his scattered forces together, Gustavus offered battle to the enemy, and, when that was declined, assaulted his intrenched position, but without effect. Leaving a sufficient garrison to defend the exhausted city, he advanced a second time into Bavaria, where he hoped to draw Wallenstein after him, and thus transfer the seat of war to the enemy's country. But Wallenstein made a desolating march through Thuringia into Saxony, which he resolved to make his winter quarters; and again Gustavus was obliged to leave his Bavarian conquests to save his ally from such a cruel guest. On a misty November day (1632) he attacked the army of Wallenstein at Lützen (near Leipsic). The numbers engaged were not great; according to Ranke, the Swedes were 14,000, the imperialists only 12,000 at the beginning of the conflict; but the battle was one of the fiercest recorded in history. The Swedes had carried the strong positions of the enemy and turned his own cannon against him, when the cavalry of Pappenheim, which had left the main army shortly before the battle, appeared on the field. The Swedes were hurled back, and the king, too eagerly hurrying forward to re-form the battle, was separated from his guards and shot. Wild with rage and sorrow, the Swedes renewed the attack, overthrew the enemy, and won his artillery again. Without making any effort to recover it, Wallenstein retreated into Bohemia, while the Swedes carried the disfigured body of their king from the battlefield. It was laid to rest in the Riddarholm church at Stockholm.

GUSTAVUS III. (1746-1792), king of Sweden, succeeded his father Adolphus Frederick at the age of twenty-five. He was in Paris when his father died, and was an enthusiastic admirer of everything French. His manners were popular; he was brave, resolute, and eloquent. At the beginning of his reign he found the royal power completely overshadowed by the nobles, who in the council virtually dictated the government of the country, and had involved it in frequent disturbance and disgrace. A revolt, contrived for the purpose by one of his adherents, gave Gustavus a pretext for marshaling his guards, whom he won over and employed to make a complete change in the constitution. In many respects Gustavus made an excellent use of his great power; he improved the army and navy, reformed the administration of justice, abolished torture, and built hospitals. But his foolish aping of French fashions, and his dream of reviving the knightly exercises and accomplishments, led him into great extravagance.

In 1788, in his campaign against Russia, several nobles, officers of his army in Finland, refused to carry on the war because it had not been sanctioned by the estates. Angry at this Gustavus summoned the hardy Dalecarlians to his aid, deprived the nobles of their exclusive privileges, and made his power absolute. He continued the Russian war with success till the peace of 1790, which made no change on the Finnish frontier. Gustavus' next project, which he prosecuted with his usual energy and disregard of consequences, was a war to save King Louis XVI. from the Revolution. This war, the estates, already weary of his expensive undertakings, refused to support. To avert a new *coup d'état* some nobles formed a conspiracy against him; and Ankarström, formerly an officer in the guard, shot him at a masked ball at Stockholm (1792).

GUSTAVUS IV. (1778-1837), king of Sweden, was son of the preceding. He was only fourteen years of age when his father was cut off, and his uncle, Duke Charles, acted as regent during the minority. Gustavus early gave proof of an obstinate strength of will and of a highly wrought temperament bordering on insanity. Thus he went to St. Petersburg, according to agreement, to marry a granddaughter of the empress Catherine, and the whole court was assembled for the ceremony. The bridegroom, however, did not appear, and the company dispersed after waiting several hours. Gustavus had drawn back at the eleventh hour, refusing to sign the marriage treaty because it bound him to grant his future queen the free exercise of her religion. He spent his whole reign under the mastery of a fixed idea, that Napoleon was the Great Beast spoken of in the Apocalypse; and he joined the great coalition of 1805 against the conqueror. In this war Swedish Pomerania was occupied by the French. Even after Tilsit, Gustavus prosecuted the war with unbroken resolution. Sweden suffered fearfully by this obstinacy of the king; the Russians conquered Finland; the Danes invaded the southern provinces; his English allies, wearied of his irrational obstinacy, left him to his fate. Sweden also grew sick of his wrong-headed policy. The officers of the army conspired against him. He was dethroned and detained in captivity, while his uncle Duke Charles was elected to the crown (1809). After the new arrangements had been made, he was banished with the assurance of a considerable income. Under the name of Colonel Gustavon he passed a wandering life abroad, dying at St. Gall in 1837.

GUSTAVUS ADOLPHUS UNION, a society formed of members of the Evangelical Protestant churches of Germany, which has for its object the aid of feeble sister churches, especially in Roman Catholic countries. The project of forming such a society was first broached, in connection with the bicentennial celebration of the battle of Lützen, on November 6, 1832; a proposal to collect funds for a monument to Gustavus Adolphus having been agreed to, it was suggested by Superintendent Grossman that the best memorial to the great champion of Protestantism would be the formation of a union for propagating his ideas.

GÜSTROW, the chief town of the Wendian circle of the grand duchy of Mecklenburg-Schwerin, Northern Germany, is situated on the Nebel and on the railway from Lübeck to Stettin, twenty miles south of Rostock. Population (1900), 16,736.

GUTENBERG, JOHN, was born about 1410 at Mainz. In 1420 the citizens of Mainz drove the patricians out of the city, and as Gutenberg's name appears about ten years later at Strasburg, the family probably took refuge there. When the expelled families were recalled to Mainz, Gutenberg did not avail himself of the privilege. We next hear of him at Strasburg, where in 1434 he

seized and imprisoned the town clerk of Mainz for a debt due by the corporation of that city, releasing him, however, at the urgent representations of the mayor and counselors of Strasburg. In 1437 Gutenberg was sued before the ecclesiastical court by Emmeline zu Iserne-Thüre for breach of promise of marriage, the case being settled by his making her his wife. The active mind of Gutenberg had adopted several plans for making money before he invented the art of printing with movable types, which is his great claim upon the gratitude of mankind. Before 1425 he engaged in some experiments requiring money, when Andrew Dritzehn, a fellow-citizen became security for him. In 1438 was arranged a partnership between Gutenberg, Andrew Dritzehn, Andrew Heilmann, and Anton Heilmann, and that this concerned the new art of printing appears from the long law proceedings which soon after followed. The action was brought by the brothers of Dritzehn, who was dead, to force Gutenberg to reveal the secrets of the partnership. The decision was in favor of Gutenberg. In January, 1441, Gutenberg obtained eighty livres by mortgaging some house property, and again in 1442 he borrowed money of Maftin Brethler for carrying on his experiments. For four years after this nothing is known of Gutenberg except that his wife paid taxes in his name. He returned to his native city, Mainz, where he borrowed 100 guilders of his kinsman Arnold Gelthus, and established himself in the house Zum Jungen, which was part of the family possessions. At this time Gutenberg must have been able to show some solid and convincing results of his new invention, for he obtained substantial aid from a shrewd goldsmith, John Fust or Faust, who advanced 800 guilders to promote the work, taking as security a mortgage on all the printing materials to be purchased. Gutenberg at once set to work upon a large folio Latin Bible, the printing of which was ended before August, 1455. During the progress of this great undertaking several forms of indulgence and other small things were printed, the earliest with a date being the Indulgence of 1454 in the library at Althorp. But the new art was not a success commercially and again Fust had to come forward with another 800 guilders to prevent a collapse. In November, 1455, Fust determined to dissolve his connection with Gutenberg, and demanded payment of his advances. Gutenberg not being able to refund so large a sum, Fust took legal proceedings against him, and he was eventually compelled to yield up the whole of the printing materials, which at once were removed by Fust to his own house at Mainz. Here with the assistance of Peter Schöffer he continued to print until the sack of the city in 1462 by Adolphus II. Gutenberg, now in the evening of life, had to make a fresh start in the world, and fortunately in Doctor Humery of Mainz found a friend who assisted him with capital. Embarrassment, however, still pursued him, and the press made slow progress. It is uncertain whether the new press of Gutenberg was in Mainz or at the neighboring town of Eltvill. On January 17, 1465, Gutenberg accepted the post at the court of Archbishop Adolphus, of salaried courtier. He received annually a suit of livery together with a fixed allowance of corn and wine. Meantime the printing materials were lent to the brothers Bechtermunze, who printed some inconsiderable works, and upon the death of Gutenberg were claimed and taken by Doctor Humery. On February 2, 1568, died Gutenberg, poor, childless, and almost friendless, after laying the foundations of an art which was soon to dominate the world. Arnold Gelthus erected a monument to his memory near his grave, and forty years after Ivo Wittig set up a memorial tablet at the legal college in Mainz.

No portrait of Gutenberg is known, those appearing

upon medals, statues, or engraved plates being all fictitious.

GUTHRIE, THOMAS, Scottish clergyman and philanthropist, was born at Brechin, Forfarshire, on July 12, 1803. He entered the university of Edinburgh at the early age of twelve (November, 1815), and continued to attend classes there for more than ten years. During that period he seems to have read widely in general literature, although he did not distinguish himself as a student in the strict sense. On February 2, 1825, the presbytery of Brechin licensed him as a preacher in connection with the Church of Scotland; but it was not till 1830 that he was inducted to his first charge, Arbirlot, in Forfarshire, where he labored for seven years. In 1837 he became the colleague of the Rev. John Sym in the pastorate of Old Greyfriars, Edinburgh, and at once attracted notice as a great pulpit orator. Toward the close of 1840 Guthrie was chosen minister of St. John's church, Victoria street, Edinburgh. His increasing popularity brought him flattering invitations both from London and from India; but these he firmly declined. He was an enthusiastic supporter of the movement which led to the disruption of 1843; and his name is thenceforth associated with the Free church. In 1847 he began the greatest work of his life by the publication of his first *Plea for Ragged Schools*. A ragged school was opened on the Castle Hill, which has been the parent of many similar institutions elsewhere. Guthrie insisted on bringing up all the children in his school as Protestants; and thus he made his ragged schools not only educational but proselytizing institutions. This interference with religious liberty led to some controversy; and ultimately those who differed from Guthrie founded the United Industrial School, which is managed on the principle of combined secular and separate religious instruction. In April, 1847, the degree of D.D. was conferred on Guthrie by the university of Edinburgh; and in 1850 Dr. Hanna, the biographer of Dr. Chalmers, was inducted as his colleague in Free St. John's Church.

In 1864 he resigned public work as pastor of Free St. John's (May 17), although his nominal connection with the congregation ceased only with his death. Guthrie had occasionally contributed papers to *Good Words*, and, about the time of his retirement from the ministry, he became editor of the *Sunday Magazine*, contributing several series of papers which were afterward published separately. In 1865 he was presented with \$25,000 as a mark of appreciation from the public. His closing years were spent in retirement; he died at St. Leonard's-on-Sea, February 24, 1873.

GUTHRIE, the leading city in the territory of Oklahoma, is situated on the Cimarron river, and on the Atchison, Topeka and Santa Fé railroad, and though its settlement is of comparatively recent date, the city has attained to remarkable growth and development. Two daily papers are regularly published, and the commercial interests and manufacturing industries are steadily increasing in volume and importance. The city contains manufactures of lumber, ice, sash, doors and blinds, etc., a very large number of supply stores, warehouses, hotels, etc., and has become a prominent point in the territory for the investment of capital and the location of business enterprises. The population (1900) was 10,066.

GUTSMUTHS, JOHANN CHRISTOPH FRIEDRICH, a German teacher and the principal founder of the German school system of gymnastics, was born at Quedlinburg, August 9, 1759. He was educated at the gymnasium of his native town and at Halle university;

and in 1785 he went to Schnepfenthal, where he taught geography and gymnastics in Salzmann's academy. His method of teaching gymnastics was expounded by him in various hand-books; and it was chiefly through them that gymnastics very soon came to occupy such an important position in the school system of Germany. He also did much to introduce a better method of instruction in geography. He died May 21, 1839.

GUTTA PERCHA (GUTTA TABAN, etc.) This name is applied to the concentrated or inspissated juice of various plants belonging to the natural order *Sapotaceae*, growing in the Malay Peninsula.

The *Dichopsis Gutta* attains a height of sixty to eighty feet with a diameter of two to four feet. The leaves are obovate-oblong and entire, pale green on the upper side, and covered beneath with short reddish-brown shining down. The flowers are arranged in clusters of three or four in the axils of the leaves. The fruit, about an inch long, is of an ovoid shape, and is eaten by the Malays. In Siak (Sumatra) a vegetable butter is prepared from the seeds. The wood is soft, fibrous, spongy, and of a pale color, and marked with black lines, these being reservoirs of gutta percha. The gutta, as it flows from the tree, is of a grayish hue, occasionally with a somewhat roseate tinge, probably arising from the color vessels of the bark becoming ruptured through surcharge, and their contents mixing with the gutta. This species does not furnish all the gutta percha of commerce; indeed there are other trees which yield larger quantities. In all there are about thirty varieties known; but some of the vernacular names in different districts may prove mere synonyms.

The geographical distribution of the trees producing gutta percha is very restricted. Many of the best varieties are found only on the hill slopes at a distance from the sea-coast, each variety forming a separate grove of from 200 to 500 trees, with high forest trees above them. They grow best in a rich light loam, with a rocky subsoil.

The collection of gutta percha generally takes place directly after the rainy season, as in the dry season the gutta does not flow so readily, while during the rainsague and jungle fever are most prevalent, and the gutta is liable to be washed away from the felled trees. The yield of a well-grown tree of the best variety is from two to three pounds of gutta percha, such a tree being about thirty years old, thirty to forty feet high, and one and half to three feet in circumference. A full-grown tree sometimes measures 100 to 140 feet to its first branches, with a girth of twenty feet at a distance of fourteen feet from the base, and may yield fifty to sixty pounds of gutta percha, which loses in six months about 35 per cent. of its weight in drying.

The methods of extracting the gutta percha are much the same among the Malays, Chinese, and Dyaks. The trees are cut down just above the buttresses, or *bannes*, as they are called.

When the tree is felled, the branches are speedily lopped off, to prevent the ascent of the gutta to the leaves. Narrow strips of bark, about an inch broad and six inches apart, are then removed, but not all round the tree, as its underpart in its fall becomes buried in the soft earth, much sap being thus lost. Some natives beat the bark with mallets to accelerate the flow of milk or gutta. The milk flows slowly (changing color the while), and rapidly concretes, and, according to its source, may vary from yellowish-white to reddish or even brownish in hue. The gutta as it flows is received into hollow bamboos, doubled-up leaves, spathes of palms, pieces of bark, cocoa-nut shells, or in holes scraped in the ground. If the quantity obtained is small, it is prepared on the spot by rubbing it together in the

hands into a block, in one end of which a hole is made to carry it by. In this state it is known in the market as "raw gutta" or "guttah muntah." If water gets mixed with the juice, the gutta becomes stringy, and is considered deteriorated, but after boiling appears quite as good. Sometimes the gutta is kept in a raw state for a month or two, and then undergoes the next step in the preparation, that is, boiling. The boiling is generally conducted in a "kwali" or pan of cast or hammered iron, of about fifteen inches in diameter and six inches deep. The boiling is either simply with water, or with the addition of lime juice or cocoa-nut oil. If one pint of lime juice be added to three gallons of gutta juice, the latter coagulates immediately on ebullition.

On arriving at the port of shipment, the gutta undergoes examination and classification into parcels, according to quality. As received in the "godowns" or warehouses, it presents great diversities in condition, shape, size, and color—from crumbling, hardly coherent, whitish or grayish "raw" or "guttah muntah" fragments, to reddish or brownish blocks as hard as wood. The price ranges from 4d. to 3s. per lb.

Gutta percha, as received in foreign ports, is in irregular clumps or blocks, and is frequently adulterated with massive stones, sawdust, bark, sago flour, and other foreign matters; and the first step in its manufacture is to cleanse it thoroughly. The blocks are first sliced by means of a powerful circular wheel driven by machinery, and having fixed in it two or three strong, chisel-like knives, by which it is divided into thin slices. These are placed in wooden troughs filled with water and heated by steam. As soon as the gutta percha becomes soft, it is taken out in baskets and placed in a toothed iron cylinder, called a "deviling" machine, which tears it into fragments; these fall into a trough of water, and the impurities sink to the bottom, leaving the purified gutta floating in the form of a spongy mass. This mass is then taken out by means of perforated shovels, thoroughly washed in cold water, and dried in baskets. It is then packed in jacketed iron chests heated by steam, and left till it becomes soft, when it is at once removed, and kneaded or masticated by means of a cast-iron cylinder, with a movable lid and an internal revolving toothed iron axis,—the result being a homogeneous dough-like reddish-brown mass. Sometimes various substances are introduced into this machine, which is called a "masticator," to increase the hardness or density of the gutta, or to color it,—such as orange or red lead, chrome, vermilion, yellow ochre, sulphur, caoutchouc, gypsum, or resin, care being taken to use such substances only as are not affected by the heat necessary in the operation. The incorporation is conducted with great nicety, as at the will of the operator a soft and elastic or a hard and horny substance can be produced. When sufficiently masticated, the gutta is placed while still hot between two steel cylinders, and thoroughly rolled. By means of an endless band of felt the gutta is returned again to the cylinders, the distance between which is gradually diminished so as to compress and completely drive out any contained air from the gutta percha. There are various machines for cutting driving bands, etc., to a uniform width, and for rounding off the edges and finishing. Soles for boots are made by cutting a long strip of the requisite width, and then passing the strip under a hollow die.

In making piping a machine is used consisting of a cylinder, with a die piece attached of the requisite size. By means of a piston the gutta percha, which is introduced into the cylinder in a plastic condition, is driven through the die-piece, and the piston gives the inner diameter of the piping. As the piping issues from the machine, it passes immediately into a trough of water,

which "sets" it, and prevents it from collapsing. The value of gutta percha piping is very great; it does not contaminate water as lead piping does; it withstands insects, damp, etc., and is easily manipulated, being shortened, lengthened, or repaired without trouble or expense; and its acoustic properties have led to its employment largely in the manufacture of aural, stethoscopic, and other instruments. Gutta percha speaking tubes are now to be seen in nearly every office. The substance too, from the fact that few acids and alkalis affect it, especially if dilute, is largely employed for funnels, siphons, and other chemical apparatus.

In telegraphy gutta percha is of the very highest importance, being a cheap, lasting, and powerful insulator, easily applied to telegraphic wires. The general method of coating telegraphic wire is by charging a cylinder with plastic gutta percha, and forcing it through a die-piece, the wire forming a central core. As the wire is drawn through this "die" or "molding" piece, it becomes coated to the requisite thickness, and after passing through water it is wound on drums ready to be coated with tarred rope, and with galvanized iron wire if required for submarine cables.

The readiness with which gutta percha, while in its plastic condition, receives an impression, which it retains when cold, early led to its employment in the decorative and fine arts, since it reproduces the finest lines, as in the taking of molds from electrotypes.

GUTZKOW, KARL, one of the most distinguished of modern German novelists and dramatists, was born March 17, 1811, at Berlin. After completing his education at the Friedrichswerder gymnasium, he entered upon the study of theology and philosophy at the university of his native town, where, having had his interest awakened by the political and social questions of the time by the Paris revolution of July, 1830, he, while still a student, began his chequered literary career by the publication in 1831 of a periodical entitled *Forum der Journalliteratur*. Although the serial was a failure and was soon discontinued, it procured for him the notice of Wolfgang Menzel, who invited him to Stuttgart to assist him in the editorship of the *Literaturblatt*. At the same time he continued his university studies, first at Jena, then at Heidelberg, and latterly at Munich. In 1832 he published anonymously at Hamburg *Briefe eines Narren an eine Nörin*, and in 1833 appeared at Stuttgart *Maha-Guru, Geschichte eines Gottes*, a fantastic and satirical romance intended to ridicule the current conceptions of the divine. In 1835, on account of a difference with Menzel, he discontinued his contributions to the *Literaturblatt*, and went to Frankfort, where he became collaborateur with Duller on the *Phönix*, and also founded the *Deutsche Revue*. In the same year appeared *Wally, die Zweiflerin*, from the publication of which may be said to date the school of writers who have received the name of "Young Germany." The work was directed especially against the institution of marriage and the belief in revelation; and whatever attention it might have attracted from its own merits was tenfold increased by the action of the government, which, besides condemning its author to three months' imprisonment, decreed the suppression of all he had written or might yet write, and prohibited him from exercising the functions of editor within the states of the *Bund*. During his term of imprisonment Gutzkow employed himself in the composition of his treatise *Zur philosophie der Geschichte*, published at Hamburg in 1836, in which he opposed the Hegelian theory as to the nature and ends of history. On obtaining his freedom he went to Frankfort, where he wrote several volumes on various subjects which he published at Hamburg and Stuttgart; but finding himself hampered in

his literary undertakings by the prohibitions of the Prussian Government, he removed in 1837 to Hamburg. Here he inaugurated a new epoch of his literary activity by bringing out his tragedy *Richard Savage*, which immediately made the round of all the German theaters, and first decidedly won the ear of Germany for the modern drama. Of his numerous other plays the majority are now neglected. In 1842 Gutzkow paid a visit to Paris, of which he gave an account in *Briefe aus Paris*. After his return to Germany he resumed his stay at Frankfort, where he was chiefly occupied in preparing for the press an edition of his collected works, published in twelve volumes, 1845–46; but in 1847 he went to Dresden, where he succeeded Tieck as director of the court theater. About the same time began that period of his literary activity to which belongs the series of remarkable works of fiction intended to depict the action and tendency of the principal intellectual, social and religious forces in modern society. The chief of these novels are *Die Ritter von Geiste* (9 vols., Leipzig, 1850–52) and *Der Zauberer von Rom* (9 vols., Leipzig, 1859–61). In 1864 he had an attack of insanity, during which he made an attempt upon his life; and although after his recovery he continued to write as voluminously as formerly, his productions show henceforth decided traces of failing powers. On account of a return of his nervous malady, Gutzkow in 1873 made a journey to Italy, and on his return took up his residence in the country near Heidelberg. Although some time before his death he had been confined to his sick chamber at Frankfort, its occurrence, December 16, 1878, was due to accidental suffocation from smoke.

GÜTZLAFF, KARL FRIEDRICH AUGUST, a missionary to China, was born at Pyritz in Pomerania, July 8, 1803. In 1826, under the auspices of the Netherlands Missionary Society, he went to Batavia, where by intercourse with the Chinese residents he perfected himself in the Chinese language. He, however, severed his connection with the Netherlands Society, in 1828, and went to Singapore; and in August of the same year he removed to Bangkok, the capital of Siam, where he occupied himself in translating the Bible into Siamese. In 1829 he married an English lady, who aided him in the preparation of a dictionary of Cochin China, but she died in August, 1831, before its completion. Shortly after her death he sailed to Macao, in China, where, and subsequently at Hong Kong, he worked at a translation of the Bible into Chinese, published a Chinese monthly magazine, and wrote in Chinese various books on subjects of useful knowledge. He also at different times undertook voyages on the coast of China, and in 1834 he published at London an account of them under the title *Journal of Three Voyages along the Coast of China in 1831, 1832, and 1833*. He died at Hong Kong, August 9, 1851.

GUY, THOMAS (1644–1724), founder of Guy's Hospital, London, was the son of a lighterman and coal-dealer at Southwark. After serving an apprenticeship of eight years with a bookseller, he, in 1668, began business on his own account. He dealt largely in Bibles, which had for many years been poorly and incorrectly printed in England. These he at first imported from Holland, but subsequently obtained from the university of Oxford the privilege of printing. Thus, and by an extremely thrifty mode of life, and more particularly by investment in government securities, the subscription of these into the South Sea Company, and the subsequent sale of his stock in 1720, he became master of an immense fortune. He died unmarried, December 17, 1724. In 1707 he built three wards of St. Thomas' Hospital, which institution he otherwise subsequently benefited; and at a cost of £18,793, 16s. he

erected Guy's Hospital, leaving for its endowment £219,499; he also endowed Christ's Hospital with £400 a year, and in 1705 built almshouses at Tamworth, his mother's birthplace, which was represented by him in parliament. The residue of his estate, which went to distant relatives, amounted to about £80,000.

GUY OF WARWICK, an old English metrical romance which is known to have existed in French as early as the end of the thirteenth century. Its authorship has been assigned to Walter of Exeter, a Franciscan monk of the thirteenth century, and, although this supposition has been generally disputed, Tanner regards it as probable.

GUYON, or GUION, JEANNE MARIE BOUVIÈRES DE LA MOTHE, a leading exponent of the quietistic mysticism of the seventeenth century, was born of wealthy parents at Montargis, department of Loiret, on April 13, 1648. From infancy a sickly and excitable child, she was at the age of two years and a half placed for a short time under the charge of the Ursuline nuns of Montargis. In her twelfth year she communed for the first time, and also began to form some acquaintance with the writings of St. Francis de Sales and of his disciple, Madame de Chantal, "la Sainte de Monthélon." In imitation of the latter, she tells us in her autobiography, that she at this time carried the name of the Saviour visibly inscribed on her person, subjected herself to severe bodily austerities, and made a solemn vow ever to aim at the highest perfection in an absolute surrender of her will to God. She wished also to take the veil, and made an attempt, by means of a forged letter purporting to be signed by her mother, to gain admission into the order of the Visitation of Mary, but her father interfered. In 1663 she removed along with her parents to Paris, where her youth, beauty and talent secured for her a very flattering reception; in the following year, before she was quite sixteen, she was married to M. Guyon, a man of some wealth and position, but of weak health, and twenty-two years her senior. It was in her twenty-first year, on July 22, 1668, she tells us, that, after much reading of Thomas à Kempis, St. Francis de Sales and other religious writers, much spiritual conversation with those who knew best about the mysteries of the "inner life" and the happiness of the state of "recollection in God," much groping in deep darkness, and much wrestling in agonized prayer, she at last experienced the change of heart which filled her with joy and peace in the life of faith. On July 21, 1676, she was left a widow, with three surviving children—two sons and an infant daughter—and began to live a life of still deeper seclusion and isolation than before, interesting herself, however, in works of charity, and in the education of her family.

Gradually, in the course of 1681, she had almost, though with hesitation, reached the conclusion that she was called to active religious work in that part of France and Savoy which borders on Geneva, if not Geneva itself; and finally she fixed her abode at Gex under the spiritual care of D'Aranthion, by whom La Combe was assigned to her as her director in the place of Bertot, who had died some time before. Here she at once began her benevolent labors, tending the sick and poor, praying with them and giving them religious instruction. The alienation of the bishop made her stay at Gex far from comfortable; and, at the close of a residence of rather more than six months, she removed early in 1682 to Thonon, apparently in the expectation of being near her adviser La Combe. Here she remained for upward of two years. Meanwhile her doctrines of "pure love" and of that "fixed state," which consists in the complete identification of the human will with the will

of God were taking more definite shape; and in 1683 they first found literary expression in *Les Torrens*. Although Madame Guyon was not herself conscious of any disharmony with the teaching and practice of the Catholic Church, her doctrines could hardly fail to be regarded by the ordinary orthodoxy of that time as more or less hostile to the generally accepted views as to the nature and mode of sanctification, and as to the normal state of the graciously renewed heart; at Thonon they soon gave deep offense, and ultimately it was intimated both to her and to La Combe, on the part of Bishop D'Aranthon, that both must leave the diocese. Her next resting place for a few weeks was Turin, whence, in the autumn of 1684, she removed to Grenoble. Nice, Genoa, and Vercelli (where she again met La Combe) were visited in turn; but it was finally resolved that Paris now offered itself as the field of labor most suited to her powers. Here accordingly she arrived on July 22, 1686, and soon she and her teaching began to meet with a very favorable reception in the higher circles of society. Meanwhile the doctrine of Molinos and the *Guida Spirituale* had been formally condemned by the Inquisition at Rome, and the sentence had been taken up as a signal, especially in France, for the persecution of all suspected quietists. In October, 1687, La Combe was suddenly arrested by a royal "lettre de cachet" and committed to the Bastille; and by the same authority Madame Guyon herself was, three months later (January 29, 1688), ordered to be detained as a prisoner in the convent of St. Marie in the Faubourg Sainte Antoine. The charges brought against her were the maintenance of heretical opinions; the holding of private religious assemblies, contrary to the practice and rules of the Catholic Church, for the spread of these opinions; the publication of a dangerous book containing opinions similar to those of the *Spiritual Guide* of Molinos; and correspondence with Molinos. These, however, were not destined to come to a definite issue, for, through influence which friends succeeded in bringing to bear upon Madame de Maintenon, a release was obtained in the following October. Madame Guyon went to live with her daughter, who had become the Comtesse de Vaux; but while on a visit with the duchess of Charost she became acquainted with Fénelon, and a considerable correspondence began. Her influence continuing to make itself felt at Paris, Dijon, Versailles, and other places, especially in the institution of St. Cyr, founded by Madame de Maintenon in 1686, the attention of theologians was drawn afresh to the "new spirituality," as it was called; and among others both the Port-Royalist Nicole and Bossuet, bishop of Meaux, sought personal interviews. Rumors prejudicial not only to the orthodoxy of Madame Guyon's faith, but also to the purity of her life, caused great scandal in the highest quarters, so that at last she was constrained to write to Madame de Maintenon requesting that a number of suitable persons might be selected for the purpose of judging both of her doctrine and her morals. A commission was duly nominated, consisting of Bossuet, Bishop (afterward Cardinal) De Noailles, and Tronson, the superior of St. Sulpice. To this tribunal she at their request submitted the *Moyen Court, Les Torrens*, and the manuscripts of her commentaries along with her autobiography, to which she added her *Justification*. The outcome of many deliberations, extending over some months, was the preparation of twenty-four articles, usually called the "Articles of Issy," relating to the doctrine of "pure love." Her refusal to sign a "condemnation of religious errors," as drawn up and presented to her by Bossuet in a pastoral ordinance and letter, now led to an open rupture which resulted in her reimprisonment, on this occasion at Vincennes, on December 27, 1695. She

was not released until 1702, in which year she was banished to Blois, where the remainder of her life was spent. She heard mass daily, received the sacrament every alternate day, and died in full communion with the Roman Catholic Church, after an illness of three months, on June 9, 1717.

GUYTON DE MORVEAU, LOUIS BERNARD, BARON, a distinguished French chemist, was born January 4, 1737, at Dijon. He obtained in his twenty-fourth year the office of advocate-general in the parliament of Dijon, of which he fulfilled the duties till 1782. In 1772 he published at Dijon the *Digressions Académiques*, in which were set forth his views with respect to philogiston and the phenomena of crystallization; and in 1773 he discovered the efficacy of hydrochloric acid gas as an atmospheric disinfectant. He was the means, in 1774, of founding in Dijon courses of public lectures on mineralogy, materia medica, and chemistry, the last of which he himself during thirteen years gratuitously delivered. In 1777-78 appeared the *Éléments de Chimie Théorique et Pratique* (3 vols. 12mo) of de Morveau, Maret and Durande, a work highly appreciated by their contemporaries. The chemical articles in vol. i. of the section "Chymie, Pharmacie, et Metallurgie," of the *Encyclopédie Méthodique* (1786), as also some few of those of vol. ii. (1892), were from the pen of De Morveau.

De Morveau's first essay on a new chemical nomenclature was published in the *Journal de Physique* for May, 1782, and was the subject of much adverse criticism. Repairing to Paris, the author successfully met the objections of his opponents; and in 1787, in conjunction with Lavoisier, Berthollet and Fourcroy, he published *Méthode d'une Nomenclature Chimique*, the principles of which were speedily adopted by chemists throughout Europe. The first manufactory of carbonate of soda in France was established by De Morveau in 1783. In 1791 he represented the department of Côte d'Or in the legislative assembly, and next year in the national convention, of which he was reelected a member in 1795. Having already become famous for aeronautical experiments at Dijon in 1783-84, he was appointed in 1794 to superintend the construction of balloons for military purposes. About the same time he rendered important service to his country by perfecting the processes for the manufacture of gunpowder and saltpeter. In 1796 De Morveau was made a member of the institute. He retired from political life in 1797, and in 1798 became provisional director of the Polytechnic School, in the foundation of which he had been actively concerned. He held during 1800-14 the appointment of master of the mint, received in 1803 the cross of the legion of honor, and was made in 1805 an officer of the same order, and in 1811 a baron of the French empire. He died January 2, 1816.

GUZERAT or GUJARAT, the name given to the northern seaboard of the Bombay Presidency, extending from 20° to 24° 45' N. latitude, and from 69° to 74° 20' E. longitude. It is to the northern part of the presidency what the Konkan is to the south, and is bounded on the north by Rájputáná, on the east by the spurs of the Vindhya and Sátপুরá ranges, on the south by the Konkan, and on the west by the sea. On the mainland it comprises the British districts of Surat, Broach, Káira, Páñch Maháls, and Ahmedábád, with a total area of 10,082 square miles, and a population (1901) of 3,000,000; together with the great but scattered territories of the Gaikwar of Baroda, and also the native states of the Mahi Kánta and Rewá Kánta agencies, Palanpur, Radhanpur, Balasinor, Cambay, Dang, Chaurar, Bansda, Peint, Dharampur, Tharad, Sachin, Wasravi, etc. The term Guzerat is sometimes em-

ployed to include the peninsula of Káthiáwár, with its 180 petty states. The total area, inclusive of the peninsula of Káthiáwár, is 41,536 square miles. For an account of the history, geography, etc., of Guzerat, see the articles on the various states and districts. Guzerat gives its name to the vernacular of northern Bombay, viz., Gujaráthi, one of the three great languages of that presidency.

GUZMICS, IZIDÓR, Hungarian theologian and scholar, was born April 7, 1786 at Vámos-Család, in the county of Sopron, and died September 1, 1839.

GWALIOR, a native state in political relationship with the Central India Agency and the Government of India. The state consists of several detached districts, the principal of which is bounded on the northeast by the Chambal river, dividing it from the British districts of Agra and Etáwáh, on the east by Bundelkhand and Ságár (Saugor) districts, on the south by the states of Bhopál and Dhar, on the west by those of Rajgarh, Jhaláwar and Kotah, and on the northwest by the Chambal, separating it from Karauli (Kerowlee), and Dholpúr in Rájputáná. The area, including part of the ancient province of Agra and most of Malwa, is 29,047 square miles. The Sind, with its tributaries the Kuwári, Asar, Sankh and other smaller streams, flows through the state. The chief products are opium, known as Malwa opium, wheat, gram, pulses of various kinds, *joár*, *bájra*, *mug*, maize, rice, linseed and other oil-seeds, garlic, tumeric, ginger, sugar-cane, indigo, *al* yielding a fine red dye, tobacco, and cotton. Many species of wild beasts and birds are found throughout the state. The rivers abound in fish, especially of the carp kind.

Burhánpur is the site of a considerable manufacture of fine cottons, silks, and rich brocades. Iron ore is raised and smelted in many places. The principal imports are British woollens, cottons, silks, cutlery, cashmere shawls, pearls from the Persian Gulf, Ceylon diamonds, and agates from Bundelkhand, gold, silver, mercury, copper, lead, and zinc. The chief exports are opium, cotton, tobacco, dyes, and iron. The Indore and Ajmere narrow-gauge railway, built in 1879, passes through the west of Gwalior state, while a railway on the broad gauge, connecting Gwalior town with Agra, has been completed.

During the hot and dry seasons the climate is not unhealthy, but during the rainy season fevers prevail, especially in the north. The range of the thermometer is unusually small, except during the sultry season when it sometimes rises to nearly 100° during the day. The average rainfall during the rainy season is fifty inches.

The population of the northeastern part of this territory is of many elements, comprising, besides Marhattás, (the ruling race), Bundelas, Játs, and Rájputs, with some less distinctly defined divisions of Hindus and Mahometans. There is perhaps no part of India where the tribes of Bráhmans are so various and their number so great as in the southern and southwestern parts. The Mahometan population is estimated at about a twentieth of the whole. Including the cessions to Sindhia under the treaty of 1860, the territories of the Gwalior state were in 1901 estimated to contain a population of about 3,600,000.

GWALIOR, the capital of the Gwalior state, and fortress residence of the Maharája Sindhia, sixty-five miles south from Agra, and 277 northwest of Allahábád. Gwalior city has a threefold interest—first, as a very ancient seat of Jain worship; secondly, for its example of palace architecture of the best Hindu period (1486-1516), and thirdly, as the fortress capital of one of the greatest native chiefs of India.

There are several remarkable Hindu temples in Gwalior. One, known as the Sas Báhu, understood to be of Jain erection, is beautifully adorned with bas-reliefs, and is now resorted to both by the Vaishnav and Siva sects. It was finished in 1093 A.D., and, though much dilapidated, still forms a most picturesque fragment.

The palace built by Mán Sinh (1486-1516) forms the most interesting example of early Hindu work of its class in India. Another palace of even greater extent was added to this one in 1516; both Jahángír and Sháh Jehán added palaces to these two—the whole making a group of edifices unequalled for picturesque and interest by anything of their class in Central India. Among the apartments in the palace was the celebrated chamber, named the *Báraddári*, supported on twelve columns, and forty-five feet square, with a stone roof, forming one of the most beautiful palace halls in the world.

The fort of Gwalior stands on an isolated rock. The face of the fort is perpendicular, and where the rock is naturally less precipitous it has been scarped. Its greatest length from northeast to southwest is a mile and a half, and the greatest breadth 300 yards. The rock attains its maximum height of 342 feet at the northern end. A rampart, accessible by a steep road, and farther up by huge steps cut out of the rock, surrounds the fort. The citadel stands at the northeastern corner of the inclosure, and presents a very picturesque appearance. The old town of Gwalior, which is of considerable size, but irregularly built, and extremely dirty, lies at the eastern base of the rock. It contains the tomb of Muhammad Ghaus, which was erected during the early part of Akbar's reign. The fort of Gwalior, according to Wilford, was built in 773 A.D., by Surya Sen, the rájá of the neighboring country.

GWILT, JOSEPH, author of the *Encyclopedia of Architecture*, was born at Southwark, January 11, 1784. In 1811 he published a *Treatise on the Equilibrium of Arches*, and in 1815 he was elected a fellow of the Society of Antiquaries of London. After a visit to Italy in 1816, he published in 1818 *Notitia Architectonica Italiana, or Concise Notices of the Buildings and Architects of Italy*. In 1825 he published, with notes and valuable additions, an edition of Sir William Chambers' *Treatise on Civil Architecture*; and among his principal other contributions to the literature of his profession are a translation of the *Architecture of Vitruvius* (1826), a *Treatise on the Rudiments of Architecture, Practical and Theoretical* (1826) and his valuable *Encyclopedia of Architecture* (1824), which has passed through a great many editions, and was published with additions by Wyatt Papworth in 1867. He died September 14, 1863.

GWYNIAD is the name given to a fish of the genus *Coregonus*, inhabiting the large lakes of North Wales and the north of England.

GYARMAT, a Magyar term signifying *colony*, and applied to several places in Hungary. Of these the following two towns have the largest number of inhabitants.

BALASSA-GYARMAT, capital of the Cis-Danubian county of Nógrád, is situated on the Ipoly, about forty miles north-northeast of Budapest. Population, 6,435.

FÜZES-GYARMAT, a market-town in the Trans-Tibiscan county of Békés, is somewhat unfavorably situated in the extensive marshy tract of country known as the Sárret. Population, 5,735.

GYARMATHA, a market-town in the county of Temes, Hungary, situated in a level but productive agricultural district to the northeast of Temesvár.

GYERGÝO-SZENT-MIKLÓS, a market town of

Hungary, in the Transylvanian county of Csik, is situated in a mountainous but well-wooded district, ninety-six miles east of Klausenburg, and about twenty-five west of the Moldavian frontier.

GYGES, founder of the third dynasty, called Merinad, of Lydian kings, reigned about 687-654 B.C. In the reign of Candaules, Gyges, perhaps after banishment, attempted during the troubles caused by the Cimmerian invasions into Asia Minor, to gain the royal power. He was aided by foreign, especially Carian, mercenaries, but was strenuously resisted by the native population. At last it was agreed to refer the decision between the old Heraclid dynasty and the new claimant to the national god Heracles; but, to ensure impartiality they appealed to him under his Greek form of Apollo. The Delphic oracle gave its answer in favor of Gyges, and the presents with which his gratitude enriched the shrine were seen and described by Herodotus.

GYLLEMBOURG-EHRENSVÄRD, THOMASINE KRISTINE, BARONESS, the most eminent female writer of Denmark, was born November 9, 1773, at Copenhagen. Her maiden name was Buntzen. Her great beauty early attracted notice, and before she was seventeen she married the famous political writer, Peter Andreas Heiberg. To him she bore in the following year a son, afterward illustrious as the poet and critic Johan Ludvig Heiberg. In 1800 her husband was exiled and she obtained a divorce, marrying in December, 1801, the Swedish Baron Ehrensvärd, himself a political fugitive. Her second husband, who presently adopted the name of Gyllembourg, died in 1815. In 1822 she followed her son to Kiel, where he was appointed professor, and in 1825 she returned with him to Copenhagen. In 1827 she first appeared as an author by publishing her romance of *The Polonius Family* in her son's newspaper *The Flying Post*. In 1828 the same journal contained *The Magic Ring*, which was immediately followed by *An Everyday Story*. From this time forward she took a foremost place among the writers of her time, but preserved her anonymity with entire success. In 1833-34 she published three volumes of *Old and New Novels*. *New Stories* followed in 1835 and 1836. In 1839 appeared two novels, *Montanus the Younger* and *Ricida*; in 1840, *One in All*; in 1841, *Near and Far*; in 1843, *A Correspondence*; in 1844, *The Cross Ways*; in 1845, *Two Generations*. From 1849 to 1851 the Baroness Ehrensvärd-Gyllembourg was engaged in bringing out a library edition of her collected works in twelve volumes. On July 2, 1856, she died in her son's house at Copenhagen.

GYMNASIUM was the name applied by the Greeks to a building designed for the practice of physical exercises. From the earliest times we hear of athletic sports in honor of heroes and gods. Sometimes they are celebrated among the funeral rites of a deceased chiefs, sometimes they form part of a periodic festival. At first competitors exercised stripped of their outer garments (*γυμνοί*): hence arose the name *gymnasium*. Afterward the habit of exercising naked became universal. In the continuance of their history the Greeks grew more attached to such sports; their free active life, spent to a great extent in the open air, fostered the liking almost into a passion. The victor in any athletic contest, though he gained no money prize, was rewarded with the honor and respect of his fellow-citizens; and a victory in the great religious festival was counted an honor for the whole state. In these circumstances the training of competitors for the greater games became a public concern; special buildings and officials were provided for the purpose by the state. But, as gymnastics became more and more an institution of social life, the *gymnasia* were applied to other uses even more impor-

tant. The most interesting points are the connection with education on the one hand, with medicine on the other. Due training of the body and maintenance of the health and strength of children were the chief part of earlier education. Except the time devoted to letters and music, the education of boys was conducted in the *gymnasia*, where their moral training was as carefully attended to by special officers as their physical exercises. As they grew older conversation and social intercourse took the place of the more systematic discipline. Philosophers and sophists assembled to talk and to lecture in the *gymnasia*, which became places of general resort for the purpose of all less systematic intellectual pursuits, as well as for physical exercises. Plato, when treating of education, devotes much consideration to gymnastics. Gymnastic exercises proper were designed, not merely as in Sparta, to foster the taste for war and the activity and strength needed for using weapons, but also to produce graceful carriage and healthy tone of the body. According to Plato, the sophist Prodicus first pointed out the connection between gymnastics and health. Having found such exercises beneficial to his own weak health, he formulated a method which was adopted generally, and which Hippocrates improved on. The *gymnasia* were large buildings which contained, not merely places for each kind of exercise, but also a stadium, baths, covered porticos for practice in bad weather, and outer porticos where the philosophers and men of letters read public lectures and held disputations. In Athens there were three great public *gymnasia*—Academy, Lyceum, and Cynosarges—and every Greek city of consequence seems to have possessed one. Ruins of them exist at Pergamus, Ephesus, Alexandria in Troas, etc., from which, and from the accounts of Vitruvius (v. 11), it would appear that all were constructed on much the same plan. The details will be found most clearly given in Rich's. *Dictionary of Greek and Roman Antiquities*.

Gymnasium, in its modern use, generally signifies a school for gymnastic exercises, but it is sometimes used also to denote a higher school intended to give immediate preparation for the universities. The latter application of the term is specially prevalent in Germany.

GYMNASTICS, in the general acceptance of the term, denotes every exercise which tends to develop and invigorate the bodily powers, such as walking, running, diving, fencing, rowing, skating, dancing, and many others. In another sense gymnastics includes those manly and healthful games which have been encouraged by all high-minded nations as calculated to improve the physical strength and keep alive the martial spirit of their people. In a more limited sense, the term has been employed to denote the modern system of bodily exercises. Physical strength was the veritable god of antiquity, and we therefore find the elements of a system of gymnastics in most nations from the earliest times. The following considerations appear to be of great weight as supporting the views put forward by the advocates of physical education. While the national games may seem to some sufficient for the physical development of the ordinary youth and manhood of a country, it must not be forgotten that there is a vast and rapidly increasing portion of the population, especially in large cities, to whom the "national games" are quite unknown diversions, and that it is among this class that the most marked deterioration in physical development is only too apparent. The children of this class dwell cooped up in narrow, ill-lighted, and worse-ventilated courts, from which they are often dragged to undergo a certain amount of mental training, in many cases perhaps too severe to be sustained by their debilitated and enfeebled bodies.

While so much is being done for the mental culture of the rising generation, their physical culture is left very much to inclination or chance. But there is another source of danger put forward by those who advocate the sufficiency of the national games, viz., "the neglect of any classification of games at school, and allowing the weak and strong to engage in them indiscriminately, to the detriment of the physical wellbeing of the more delicate;" and they proceed to show the injury that may be done by the present system of competitive outdoor sports unregulated by judicious restraint. Acting upon the well-grounded opinion that neither mental serenity nor mental development can exist with an unhealthy animal organization, and admonished by "the sad deaths of two promising young men, and the breaking down in health of others just at the end of their college course," the authorities of Amherst College were impelled to demand that the college officials should give a proper attention to physical health as well as to the culture of those powers for which departments were ordinarily created and endowments made. In 1859 a department of physical education and hygiene was created, concerning which we read in the catalogue of 1861-2 that —

"Its design is to secure healthful daily exercise and recreation to all students; to instruct them in the use of the vocal organs, movement of the body, and manners, as connected with oratory, and to teach them, both theoretically and practically, the laws of health. This daily physical training is a part of the regular college course. The professor is an educated physician, and has not only a general oversight of the health of the college, but students have the privilege of consulting him without charge. While the gymnasium will furnish opportunities for the highest physical training, the required exercises will be such as can be performed without undue effort or risk of injury."

Each class, at a stated hour on four days of the week appears at the gymnasium, and all perform their part in systematic and methodical exercises timed to music. The statistics of this department show some interesting facts in reference to the duration of sickness among students. While the average amount of time lost on account of sickness by each laborer in Europe is found to be nineteen or twenty days each year, the returns of Amherst college sick-list for term time give 2.64 days as an annual average of time lost to every student, and 11.36 days to each sick student for seventeen years. A decrease in the amount of sickness during the course is also an important feature in the health of the college.

Considerable attention is now being paid to the best methods for improving the physical education of the people in nearly all the Continental states. The greatest activity is perhaps shown by Sweden, Germany, France, Belgium, and Italy; and even in Russia the question is attracting much public attention, Doctor Berglund having been ordered to write a special book on the subject. In Hungary also the government has made physical education an obligatory part of the school curriculum. In Prussia gymnastic instruction was formally recognized by a cabinet order of June, 1842, and by a royal order of 1862 a guide-book of gymnastic instruction was introduced into the primary schools and into the training colleges for teachers. In Sweden this subject appears to have earlier attracted attention, for in 1813 the government, under the direction of P. H. Ling, founded the Royal Central Gymnastic Institute at Stockholm, where teachers of both sexes are gratuitously trained for two years, and receive a diploma after undergoing a theoretical and practical examination. In Belgium, under the united efforts of MM. Delcour and Emile Greyson, considerable progress has been made,

although much has still to be done, owing to the opposition raised by the municipality of Brussels to the views put forward by the government. In the girls' schools the exercises are accompanied by music, after the example set by Colonel Ameros, who about the beginning of this century introduced into France a series of gymnastic exercises adapted to a jingling rhyme and to music. The chanting governed the movements, marked the intervals of repose, and helped to strengthen the organs of the voice and respiration. In France the necessity for the physical education of the people began to attract attention about the year 1845, owing probably to the energy displayed by Jahn in Prussia. M. de Salvandy proposed to introduce the teaching of gymnastics into the Lycées of Paris and Versailles, and a commission was appointed by him, which, however, never presented a report. In 1850, 1851, 1855, and 1856 several attempts were made to enforce a compulsory gymnastic training, but the principle was not accepted till 1869, when M. V. Duruy took for his basis of action the labors of the commission presided over by Doctor Hillairet.

In England we find that the first attempt to introduce scientific physical education among the people was made in parliament in 1862 by Lord Elcho. This attempt failed, as also did another made in 1875 by P. A. Taylor, M.P. for Leicester, although supported in an able speech by Mr. Butler Johnstone. Lord Sandon, then vice-president of the committee of council on education, told parliament that "the government has done all that could be expected of them for physical education by taking steps to substitute military drill for ordinary drill." The substitution, it may be remarked, does not appear to have any advantage over the drill it displaced, as the military authorities declared the ordinary military drill to be insufficient for the requirements of the soldier, and have during the last sixteen years instituted gymnasiums at Aldershot, Gibraltar, Malta, and elsewhere, the teachers in which have, for the most part, passed under the care of Mr. Maclaren of Oxford, one of the principal authorities on the subject in England. Without entering into details, it may be admitted that the physical condition of the people, if not actually deteriorating, is not improving, and it is a significant fact that within the last year or two it has been found necessary to lower the standard in the British army, and that Doctor Ord, in his report for 1869, states that out of 5,567 boys 4,410 were rejected as under the standard of width of chest and height.

Although there is some diversity of opinion among teachers of gymnastics as to the relative value of the different exercises, some holding that "free exercises" are sufficient, others that certain mechanical appliances are necessary, yet all agree that, to insure healthy and perfect development of the organs of the body, a course of gymnastics must commence with such simple exercises as walking, running, jumping, etc. The introductory course ordinarily consists of "movements and positions," and the use of dumb-bells and bar-bells. In some French gymnasiums, especially those presided over by M. Laisné of Paris, an instrument invented and called by him a "xylofer" is in use, consisting of a wooden stick strengthened and weighted with a rod of iron, and corresponding apparently to the bar-bells of English teachers. Another form of movable apparatus, also in use in some Continental schools, consists of sticks on which slide wooden spheres of from six to seven inches diameter, prevented from slipping off by india-rubber rims at each end. The movements which accompany the use of the stick are intended to expand the chest and increase the power of the muscles of the back. In stretching the arms outward from the bent

position, the spheres fly outward and very much increase the energy of the movement.

For the preliminary exercises with movable apparatus, the dumb-bell is that usually selected. It was in use in England in the time of Elizabeth. It has many advantages over the Indian club, the practice of the dumb-bell requiring a less amount of room, and not presenting the risk the club does of overstraining the body by its unskillful use.

The dumb-bell admits of being exactly proportioned to the individual strength of each learner, and can be adjusted in weight as his strength increases. The exercises, also, that may be performed with it give employment to all parts of the body and to both sides equally. The *bar* is simply a two-handed dumb-bell. Next in order come walking, running, and leaping, the exercises being so regulated that both the distance and speed are gradually increased. The *leaping rope* is suspended from a beam, and enables the leaper to clear a barrier at the same time that it gives employment to both the upper and lower limbs. The *leaping pole* is usually made of ash and varies from eight to ten feet in length. Its use may be left to the pleasure of the pupil after he has acquired some dexterity with the leaping rope.

The *horizontal beam* is a round wooden beam so mounted that it may be moved up and down. The exercises on this are chiefly balancing the body in the sitting and erect posture, and when moving along it.

The *vaulting bar* differs from the preceding in being somewhat thinner, so as to be easily grasped by the hand. The appropriate exercises on it have for their object the strengthening of the muscles of the upper extremity and loins. The *vaulting horse* allows of a wider range of exercises, and requires a greater amount of strength and dexterity. The muscles of the upper and lower limbs and trunk are all benefited by its use. The *fixed parallel bars* are used to develop the muscles of the trunk and upper limbs, but chiefly the former. The *movable parallel bars* may be used for the same exercises as the preceding. The *trapeze* consists of a horizontal bar suspended by ropes at a height of four or five feet from the floor. Considerable practice is required to perform the exercises on this machine with dexterity and neatness. The *horizontal bar*, the *bridge ladder*, the *plank*, the *inclined plane*, the *prepared wall*, and the *mast*, and several modifications of these are used.

GYMNOTUS, or ELECTRIC EEL, (*G. electricus*), the most powerful of the electric fishes, occurs in the fresh water of Brazil and Guiana. It is a type of a family Gymnotidae among the Physostomatous bony fishes. There are no dorsal nor strictly caudal fins, but the anal fin extends on to the end of the tail; there are no scales, and the eyes are very small. The fish attains a length of 6 feet, and is capable of temporarily paralyzing a man or other large animal by its shock.

GYNAECOLOGY (from the Greek *γυνή*, *gynaiōs*, a woman, and *λόγος*), that branch of medicine which concerns the pathology and treatment of affections peculiar to the female sex. (See MEDICINE.)

GYOMA, an old market town in the Trans-Tibiscan county of Békés, Hungary, is situated on the banks of the Körös main stream. It has a fine town-hall, Roman Catholic, Calvinist, and Lutheran churches, a Jews' synagogue, tax, post, and telegraph offices, a brewery, several elegant private residences, and a large station on the Szolnok-Arad Railway. Population about 10,000.

GYÖNGYÖS, the second town in importance of Heves county, Hungary, is situated at the foot of the Mátra, southwest of Eger (Erlau), and is connected by a branch line with the Budapest-Miskolcz royal state railway. Gyöngyös is the seat of a court of justice, and

contains three churches, a large monastic establishment belonging to the Franciscans, a gymnasium, manufactories of leather, hats, and woolen cloth, and distilleries. Population about 16,000.

GYÖNGYÖSI, ISTVÁN or STEPHEN, one of the most talented Hungarian poets of the seventeenth century, was born in 1620. Of his literary works the most famous is the epic poem, *Murányi Venus* (Caschau, 1664), which hymns the praises of his benefactor's wife, Maria Szécsi, the heroine of Murány. Among his later productions the best known are—*Rózsa-Koszorú*, or Rose-Wreath (1690), *Kemény-János* (1693), *Cupidó* (1695), *Palinodia* (1695), and *Chariklia* (1700). His poems are chiefly remarkable for energy, feeling and popular sentiment.

GYPSUM, the hydrated sulphate of lime, is a mineral substance occurring in various rock formations, especially in Tertiary deposits, in very considerable abundance and under varying conditions. In its transparent crystalline state it is known as selenite; when it presents a finely fibrous opalescent appearance, it is termed satin spar; and the name alabaster is reserved for the pure milky-white massive varieties. Gypsum is very generally disseminated, the most famous locality for the finer qualities worked into alabaster vases and figures being Castelfino, about thirty miles from Leghorn; while Montmartre, Argenteuil, and other places in the environs of Paris, and in the neighborhood of Derby in England, furnish inexhaustible supplies chiefly for the preparation of plaster of Paris and for agricultural use, etc. It is also found in large quantities in Nova Scotia, New York, Virginia and Michigan. The application of gypsum as a manure is referred to under AGRICULTURE, and its employment for ornamental purposes is described under ALABASTER. The preparation of plaster of Paris, so called from the fact that the industry chiefly centers in several Parisian suburbs, is the principal primary object of the quarrying or mining of gypsum. By the application of heat gypsum begins, at a temperature of about 175° Fahr., to part with its combined water. An increase of temperature causes the desiccation to proceed with great rapidity, and for manufacturing purposes the best results are obtained at from 230° to 250°. For making plaster of Paris, gypsum is burnt in kilns at about the latter temperatures, and subsequently it is powdered and ground to a fine uniform flour. So prepared it possesses the valuable property of recombining with water when mixed with it, and setting, from a thin paste, into a solid mass, the phenomenon being accompanied with some expansion and the evolution of heat. It is to this property of recombining with water that the value of plaster of Paris is principally due. Plaster of Paris is largely used for obtaining copies of statuary figures, coins, medals, sculptures, and carvings, and also for taking casts from natural objects. It is also employed as the material for molds for electro-deposits, and for the manufacture of embossed and pressed pottery ware. Still more extensively it is consumed in the finishing of internal plaster work in houses, and for making cornice moldings and other architectural enrichments in positions sheltered from the weather. A fair imitation of meerschaum is made in hardened plaster by polishing, tinting the surface with a solution of gamboge and dragon's-blood, and treating it with either melted paraffine or stearic acid. It is understood that the cheaper "meerschaum" pipes and cigar-holder are thus prepared.

GYROSCOPE, GYROSTAT, are names given to instruments which are used to demonstrate certain properties of rigid bodies, when made to rotate rapidly

about the axis round which they are kinetically symmetrical.

In some of its forms the gyroscope has been known for a long time, and it is, in all probability, of French or German invention. Almost the first instrument of the kind that we hear of, and of which the present gyroscope is merely a modification, is that of Bohnenberger, which was constructed as early as 1810, and is described in Gilbert's *Annalen* for 1818. It consisted of a heavy spheroid which could rotate inside a circular ring round its shorter axis—the axis running on pivots situated at opposite ends of the ring's diameter. This ring, with its contained spheroid, was similarly made movable inside a second ring, and round an axis at right angles to the axis of the spheroid. In the same way this second ring, with its contents, could rotate inside a third ring, and round an axis at right angles to each of the others. From this it will be seen that the spheroid had all degrees of free rotation—one point only within it being fixed, namely, the intersection of the three axes.

Under the title of precession instruments, various pieces of apparatus, involving the gyroscope principle, have been in use for a number of years for illustrating the precession of the equinoxes, and the parallelism of the earth's axis as it revolves round the sun. An instrument of this kind was given by Arago to Professor Playfair, which must have been in existence since 1816–17. Mention is made of a similar instrument as being brought from Italy to Mr. Babbage in 1827. At the close of that year a notice of an instrument akin to the gyroscope made by Mr. Henry Atkinson was read before the Astronomical Society. In 1836, in a paper read before the Royal Scottish Society of Arts, Mr. Edward Sang, C.E., Edinburgh, suggested an experiment with an instrument exactly similar to the gyroscope, by which the rotation of the earth on its axis could be directly proved. This suggested experiment was actually carried out in 1852 by M. Leon Foucault, although, in all probability, without any knowledge on his part of Mr. Sang's suggestion. Already, in 1851, Foucault, in his famous experiment with the pendulum at the Pantheon in Paris, had shown how the constancy of the plane of a pendulum's vibration could be used to show the rotation of the earth, and now, in 1852, he

applied the property of the "constancy of the plane of rotation" of a gyroscope for the same purpose. The name gyroscope was given to the instrument by Foucault at this time, and in order to perform the experiment successfully the instrument had to be constructed with the utmost exactness. The experiment was repeated at the Liverpool meeting of the British Association, and by causing a considerable sensation in the scientific world at the time, was the means of bringing the gyroscope into public notoriety.

The gyrostat is a modification of the gyroscope, devised by Sir William Thompson, which has been used by him as well as by Professor Tait for a number of years to illustrate the dynamics of rotating rigid bodies. It consists essentially of a fly-wheel, with a massive rim, fixed on the middle of an axis which can rotate on fine steel pivots inside a rigid case. The rigid case exactly resembles a similarly-shaped, but hollow, fly-wheel and axis closely surrounding the other but still leaving it freedom to move. Slits are made in the containing case whereby a cord can be coiled several times round the axis for the purpose of setting the fly-wheel in motion. There is also attached to the rigid case, in the plane passing through the center of gravity of the wheel at right angles to its axis, a thin flange of metal, which is called the bearing edge. The circumference of this flange is not a circle but a curvilinear polygon of sixteen or more equal sides. The object of making it so is to prevent the instrument from rolling like a wheel on the bearing edge when the fly-wheel is rotating rapidly.

The gyrostat is a most instructive instrument, and with it many interesting experiments can be performed.

GYTHIUM was an ancient Achæan town on the Laconian Gulf, southwest of the mouth of the Eurotas, near the site of the modern port Marathonisi. It lay opposite the island of Cranæ, at the foot of the fertile valley of the Gythius. On its coins the common types are Apollo and Heracles, the founders of the city.

GYULA, chief town of the Trans-Tibiscan county of Békés, Hungary, is favorably situated on the Fehér (White) Körös, and has a well-built station on the Nagy-Várad (Grosswardein) and Eszék line of the Alföld-Fiume Railway. Population about 21,000.

H.

H has varied in form from the Phœnician and old Hebrew symbol **Ĥ**, called Cheth, only by the removal of the upper and lower horizontal lines. The closed form is sometimes found in old Greek inscriptions, and, though less frequently, in South Italy.

Its value in Phœnicia was probably a continuous guttural sound — the sound which it had in Hebrew — resembling the German *ch*, and with no English counterpart. In Greece it represented nothing more than the spirant *h*, so long as a separate symbol to denote that sound was felt to be necessary. Afterward it was generally employed to denote a second *e*-sound, under the name of *Eta*; probably it had before been called *Heta*. The time of this change varied in different parts of Greece. In the alphabet of the island of Thera we find *H* representing *e* as early as the fortieth Olympiad; though it still sometimes retained its old value. At Athens the date was 403 B.C., and here the practice did not vary. But in most of the alphabets of Greece proper, of Peloponnesus, and of the Italian colonies, *H* still remained as the rough breathing; and as such it consequently passed into the Latin alphabet. It is possible that *h* in a very few Latin words, when it occurs as a medial sound (e.g., *traho*, *veho*), was a continuous guttural. But generally it occurs at the beginning of a word, and can hardly have been more than a breathing. Even as this it early became evanescent. During the classical period of Latin literature it was retained in the speech of educated men, doubtless in part by Greek influence. But in the popular speech it was rapidly disappearing as an initial sound; although it continued to be written, and indeed was often written wrongly, at the beginning of words where it had no place; e.g., *umor* was written *humor*, and the *h* has held its own in English spelling down to our day. The sound is almost completely lost in modern Italian.

HAARLEM, a city of the Netherlands, the chief town of the province of North Holland. By rail it is eleven miles west of Amsterdam, nineteen south of Alkmaar, and twenty north of Leyden. Distant about five miles from the German Ocean, it communicates with the Zuyder-Zee by the Spaarne and the IJ. The railway to Amsterdam was opened in 1839, and that to Alkmaar in 1867.

Haarlem is a typical Dutch town. The branches of the Spaarne and an extensive system of canals bring the ship-traffic into the heart of it, and turn its streets into so many quays. The roadways are paved with bricks; the houses have gable-ends with old-fashioned crowsteps; and everything wears a decent and quiet aspect, which to one man is dullness and to another "aristocratic gravity and modest coquetry." What the city lacks in liveliness it makes up by the interest of its historical associations and the number of its scientific and artistic institutions. The great market place es-

pecially has much that is worth seeing; the town-house and the cathedral of St. Bavo; the old meat market, a building of the end of the sixteenth century in the old Dutch style; the stadsdoelen, or place where in former times the burgesses used to assemble in arms; and the statue erected to Koster in 1856, when in Holland he was still generally considered the inventor of printing. St. Bavo's is one of the most famous churches in the Netherlands. It is a cruciform structure completed in 1538, and makes a considerable impression on the spectator by the great length (about 426 feet) of its main axis and the height and steepness of the roof. The tower is about 255 feet high, and there is a good deal of beauty about the perspective of its aisles. The organ, built by Christian Muller of Amsterdam between 1735 and 1738, was for some time the largest in the world, and is still celebrated for the sweetness of its tone, especially in the vox humana stop. It possesses four key-boards, sixty-four stops, and 5,000 pipes, the largest of which is fifteen inches in diameter. Among the monuments in the church are those of Bilderdijk the poet and the hydraulic engineers Christiaan Brunings and Fredrik William Conrad, the latter the projector of the sluices at Katwijk. At the head of the scientific institutions of Haarlem may be placed the Dutch society of sciences, founded in 1752, which possesses very valuable collections in botany, natural history and geology.

The staple industries of Haarlem have been greatly modified in the course of time. Under the counts of Holland cloth-weaving and brewing were in a very thriving condition; but under Charles V. they lost enormously in importance. After the revocation of the edict of Nantes, silk, lace and damask-weaving were introduced by French refugees, and in course of time these industries gave employment to 10,000 of the population. About the close of the eighteenth century this remarkable prosperity was a thing of the past; and it was not till after the Belgian revolution that Haarlem began to turn its attention to the various departments of manufacture in which it is now engaged. Cotton factories, carriage-works, bleach-works, cotton and silk dye-works, a famous type-foundry, oil-works, soap-works, breweries, and a factory for preserved meats are among the more important establishments. One of the printing establishments has the reputation of being the oldest in the Netherlands, and publishes the oldest Dutch paper, *De Oprechte Haarlemmer Courant*. As market gardening, especially in the flower department, is largely carried on in the immediate vicinity, Haarlem is the seat of a flourishing trade in "Dutch roots," especially in hyacinths, tulips, fritillaries, spiræas and japonicas. A considerable business is also done in the butter, cheese and other agricultural produce from the surrounding country.

Though the population of Haarlem has been steadily increasing since the beginning of the present century, it has not become so great as it was in the seventeenth. In 1901 it was 65,189.

Haarlem is mentioned in a register of the tenth century as Haralem. From Count William II. it obtained a charter in 1245, and in the course of the following centuries it rapidly advanced in prosperity. In 1492, the insurgents, called the "bread and cheese folk," got possession of the town, but before the year was out it was recovered by the imperial general Duke Albert of Saxony. The year 1493 was witness of a great conflagration, and in 1509 the plague claimed its many victims. In 1559 Haarlem became a bishop's see. The prominent part that its inhabitants took in the revolt of the Netherlands brought upon it an unparalleled disaster. Don Frederick, son of the duke of Alva, invested the town with 30,000 men in December, 1572, and after a siege, in which the burghers defended themselves with admirable and pertinacious heroism, it was obliged to capitulate in July, 1573. The conquerors, in spite of their promise of mercy, took barbarous vengeance, and it was not till July, 1677, that the town was recovered from their grasp by the prince of Orange. In its subsequent history the main events are the inundations of 1775 and 1791, the arrival of the Prussians in 1787, and the quartocentenary celebration of the invention of printing in 1823.

HAARLEM LAKE, or HARLEMMER MEER, a commune of the province of North Holland, constituted by the law of July 16, 1855. It has an area of about 46,000 acres, and its population has increased from 7,000, in 1860, to 16,602 in 1901. As its name indicates, the commune was formerly a lake, and, according to Amersfoort, this lake was a relic of a northern arm of the Rhine, which passed through the district in the time of the Romans. As early as 1643 Jan Adriaanszoon Ieeghwater proposed to endyke and drain the lake; and similar schemes, among which those of Nikolaas Samuel Cruquius in 1742, and of Baron van Nijlnden van Hemmen in 1821, are worthy of special mention, were brought forward from time to time. But it was not till 1836, when one furious hurricane, on November 9th, drove the waters as far as the gates of Amsterdam, and another on December 25th sent them in the opposite direction to submerge the streets of Leyden, that the mind of the nation was turned seriously to the matter. The first business was to dig a canal round the lake for the reception of the water and the accommodation of the great traffic which had previously been carried on. The canal was made 38 miles in length, with a depth of 9 feet, and a width of 130 feet on the west side of the lake and 115 on the east side. The preliminary works were not completed till 1845. The area inclosed by the canal was rather more than 70 square miles; the average depth of the lake was 13 feet 1.44 inches; and, as the water had no natural outfall, it was calculated that probably 1,000 million tons would have to be raised by mechanical means. Pumping commenced in 1848, and the lake was dry by July 1, 1852. At the first sale of the highest lands along the banks on August 16, 1853, 784 hectares were bought for 575,000 florins, or 733 florins per hectare, but the average price afterward was less. The whole area of 42,000 acres recovered from the waters has brought in 9,400,000 florins, or about £780,000, so that the actual cost to the nation has been 4,400,000 florins, or £300,000, though the expense of the enterprise amounted to 13,787,377 florins, or £1,080,000.

HABAKKUK, one of the minor prophets of the Old Testament, the eighth in order in the Massoretic text. The name of the prophet is peculiar to him, and occurs only in his own writing (i. l; iii. l). As to its meaning

there is some uncertainty, but it is probably a formation from a verb signifying *to entwine, to embrace*.

This book, which it is generally agreed was written by the prophet himself, forms one the finest remains of ancient Hebrew literature. In conception and style it is not inferior to any production of the most flourishing age of prophecy. The language is pure, the thought is lofty, and in the construction artistic skill is displayed. With the mantle of the prophet the author bears also the chaplet of the poet.

HABEAS CORPUS, in English law, is a writ issuing out of one of the superior courts, commanding the body of a prisoner to be brought before the court. There are various forms of this writ, according to the purposes for which it is intended. Thus *habeas corpus ad respondendum* is to bring up a prisoner confined by the process of an inferior court in order to charge him with a fresh action in the court above. Other forms are *ad satisfaciendum* (when judgment has been had against a prisoner in the court below), *ad faciendum et recipiendum*, or *cum causa* (to remove the proceedings into the superior court, the defendant being under arrest), *ad testificandum* (when the prisoner is wanted as a witness), etc. These forms are now of little or no importance. The most famous form of the writ is the *habeas corpus ad subjiendum* — the well-known remedy for the violation of personal liberty. It is addressed to the person in whose custody another is detained, and commands him to bring his prisoner before the court, with a statement of the day and cause of his capture and detention — "*ad faciendum, subjiendum, et recipiendum*, to do, submit to, and receive whatsoever the judge or courts awarding the writ may consider on that behalf."

In the United States the law of *habeas corpus* has been inherited from England, and has been generally made to apply to commitments and detentions of all kinds. Difficult questions, unknown to English law, have arisen from the peculiar features of the American State system. Thus the constitution provides that "the privilege of the writ of *habeas corpus* shall not be suspended unless when, in cases of rebellion or invasions, the public safety may require it;" and it has been the subject of much dispute whether the power of suspension under this provision is vested in the president or in congress. The weight of opinion seems to lean to the latter alternative. Again, conflicts have arisen between the courts of individual States and the courts of the Union. It seems that a State court has no right to issue a *habeas corpus* for the discharge of a person held under the authority of the Federal Government. On the other hand the courts of the Union issue the writ only in those cases in which the power is expressly conferred on them by the constitution.

HABINGTON, WILLIAM, one of the most pleasing of English minor poets, was born at Hendlip in Worcestershire, November 4, 1605. In 1634 he first published his famous volume of lyrical poems entitled *Castara*, which was reprinted in 1635 and 1640. In the latter year he also published a prose *History of King Edward IV. and The Queen of Aragon*, a tragi-comedy. The last work printed by Habington was *Observations Upon History*, 1641. In 1647 his father died; and during the Commonwealth, as we learn from Anthony Wood, the poet "did run with the times, and was not unknown to Oliver the usurper." He died November 30, 1654, and was buried in the family vault at Hendlip.

HACHETTE, JEAN NICHOLAS PIERRE, an eminent French mathematician, was born at Mézières, May 6, 1769. For his early education he proceeded first to the college of Charleville, and afterward to that of

Rheims. In 1788 he returned to Mézières, where he was attached to the school of engineering as draughtsman to the professors of physics and chemistry. When twenty-three years of age he succeeded from among a number of candidates in gaining the professorship of hydrography at Collioure and Port-Vendre. While there he sent several able papers, in which some questions of navigation were treated geometrically, to Monge, at that time minister of marine, through whose influence he obtained an appointment in Paris. Thence he passed to a deputy-professorship at Mézières, and toward the close of 1794, when the École Polytechnique was established, he was chosen one of its staff. Earlier in the year, he was present at the battle of Fleurus, and entered Brussels with the French army. In 1816, on the accession of Louis XVIII., he was expelled from his chair by Government, at the same time that his friend and fellow-worker Monge was removed from the Institute. He retained, however, till his death the office of professor in the faculty of sciences in the École Normale, to which he had been appointed in 1810—the same year in which he married the daughter of the physician Maugras. The necessary royal assent was in 1823 refused to the election of Hachette to the Academy of Sciences, and it was not till 1831, after the Revolution, that he obtained that well-merited honor. He died at Paris, January 16, 1834.

HACHETTE, LOUIS CHRISTOPHE FRANÇOIS, a French publisher, was born at Rethel in the Ardennes, May 5, 1800. He devoted several years to the study of jurisprudence, but in 1826 resolved to establish in Paris a publishing business, the main object of which should be the issue of works adapted to improve the system of school instruction, or to promote the general culture of the community. The series of works which from that time were brought out by him included manuals in various departments of knowledge, dictionaries of modern and ancient languages, educational journals, and French, Latin, and Greek classics annotated with great care by the most eminent authorities. Subsequent to 1850 he, in conjunction with other partners, published a cheap railway library, scientific and miscellaneous libraries, an illustrated library for the young, libraries of ancient literature, of modern foreign literature, and of modern foreign romance, a series of guide-books, and a series of dictionaries of universal reference. In 1855 he also founded *Le Journal pour tous*, a publication with a circulation of 150,000 weekly. He died July 31, 1864.

HACKBERRY, a name given to the fruit of the *Celtis occidentalis*, L., belonging to the natural order *Ulmaceæ*. It is also known under the name of "sugar berry," "beaverwood," and "nettle tree." The hackberry tree is of middle size, attaining from sixty to eighty feet in height, and with the aspect of an elm. The leaves are ovate, cordate-ovate, and ovate-lanceolate, with a very long taper point,—mostly glabrous above, and usually soft-pubescent beneath. The soft filmy flowers appear early in the spring before the expansion of the leaves. The fruit or berry, about the size of a bird-cherry, is of an obovate shape, of a reddish or yellowish color when young, turning to a dark purple in autumn. This tree, together with other species of the same genus, is distributed through the deep shady forests bordering the river banks of New England to Wisconsin and even further southward.

HACKENSACK, the capital of Bergen county, N. J., is a thriving manufacturing town of 9,443 inhabitants, situated on the Hackensack river, twelve miles north of New York city, and eight southeast of Paterson, N. J.

HACO, or HAKON (c. 920–90), surnamed the Good, king of Norway, was the son of Harold Fairhair by a

female slave, and was presented by Harold to King Athelstan of England, to mark his contempt for an insult he had received. The child was placed by a Norse warrior on Athelstan's knee, who was thus made to observe the symbol of adopting a child that was base born. Athelstan did not, however, take vengeance on the innocent cause of his anger, but brought him up as one of his own sons. On hearing of the death of Harold, he supplied Haco with men and ships, and sent him to Norway to wrest the throne from Eric, eldest son of Harold, whose violent and cruel reign had during the life of his father gained him the general hatred of his subjects. The news of Haco's arrival in Norway spread, says the saga, "like fire through dried grass." Eric at once took flight to Orkney and then to England, and Haco was chosen king at every "thing." Haco, though himself a Christian, found it impossible in his time to establish Christianity in Norway. He ruled his kingdom with great justice and prudence, and gained for it many victories over the Danes by land and sea. He was slain in a great fight against the Danes, led by the sons of Eric, about the year 960.

HACO, V., surnamed the Old, king of Norway, son of Haco IV., was, on the death of his father, in 1204, excluded from the throne on the ground of supposed illegitimacy, and only became king in 1223, after his mother, to establish his rights, had undergone the ordeal of fire. He greatly increased the prosperity of Norway, and he also added to his kingdom Iceland and Greenland. He died in 1264.

HADAD, the name of a Syrian deity, is met with in Scripture as the name of several human persons; it also occurs in the compound Benhadad, Hadadrimmon; and Hadadezer. The etymology of the word, of which Hadar, Ader and Arad appear to be incorrect variations, is obscure; the divinity primarily denoted by it, however, according to Philo of Byblos, is the king of the gods, the greatest and highest, the sun; and these interpretations seem to point to some such radical meaning as *vicus*.

HADDINGTON, or EAST LOTHIAN, a maritime county in Scotland. It is bounded on the north by the Firth of Forth, on the east by the North sea, on the south by Berwickshire, on the west by Edinburghshire. Its seaboard is thirty-two miles. Its greatest length from east to west is twenty-five miles, its breadth from north to south about sixteen miles. Population (1901), 38,662.

HADDINGTON, a royal and parliamentary burgh, and the chief town of the above county, is situated on the banks of the Tyne, about seventeen miles east of Edinburgh. It occupies almost the center of the shire to which it has given the name. John Knox was born here in 1505.

HADDOCK, a kind of cod-fish, distinguished by a black lateral line and a blackish spot above the pectoral fin. It is common round the British and Irish coasts, and generally distributed along the shores of the North Sea, extending across the Atlantic to the coast of North America. The haddock is prone, however, to abandon for a longer or shorter period a locality frequented by it. It attains to a weight of fifteen pounds, and is one of the most valuable food fishes.

HADERSLEBEN, a town of Prussia, capital of a circle in the province of Schleswig-Holstein, is situated forty-eight miles north of the town of that name, in a pleasant valley on the Hadersleben fiord, which is about nine miles in length and communicates with the Little Belt. The population, including the garrison, is 8,356.

HADES, a word used by Homer for the god of the under-world, and by later writers for the under-world

itself. It corresponds with the Hebrew word Sheol. In the New Testament, particularly in the Revelation, it is the equivalent of Hell, but in Psalm vi. 5, the righteous are represented as going to Sheol, rendered "the grave" in the authorized version. (See PLUTO and ESCHATOLOGY.)

HADJI KHALFA. See HAJJI KHALFA.

HADRAMAUT. See ARABIA.

HADRIAN, Roman emperor, distinguished for the peace and beneficent energy of his government, was born at Rome 76 A.D. His full name was Publius Ælius Hadrianus; his ancestors, originally from Piceum, had been settled at Italica in Spain since the time of the Scipios. He lost his father at the age of ten, and was placed under the guardianship of Trajan, a cousin of his father and also a native of Italica, who was already a conspicuous man in the Roman army. We know little of Hadrian's youth, but he gave early promise of the readiness and versatility which distinguished him in later life, for he was so ardent a student of Greek that men nicknamed him Græculus. Patronized by Trajan and assisted by powerful friends, he rose rapidly, filling successively all the civil and military offices, which were open to young men of good birth. On Trajan's elevation to the empire Hadrian was the first to congratulate him. He served with distinction in both the Dacian campaigns; in the latter Trajan presented him with the ring he had received from Nerva, a proof of his regard which justified him in aspiring to be his successor. When Trajan returned from his victorious war in Parthia, the succession was still undecided; and we are assured on the express testimony of Dion Cassius that the Empress Plotina and her friends concealed his death for several days in order to facilitate the elevation of Hadrian. Whatever may have been the truth of such stories, Hadrian's claim to the empire rested on the unquestionable fact that he was the fittest man. His position as prefect of Syria, and commander of the legions with which Trajan had prostrated the Parthian empire, made him supreme in the army, while his peaceful disposition and civil demeanor must have made him acceptable to the senate. Yet he was not unconscious of the insecurity of his position; for he hastened to propitiate the army by a donation of twice the usual amount, and to excuse his abrupt elevation to the senate by alleging the impatient zeal of the soldiers and the welfare of the state, which could not exist without an "imperator." The first important act of Hadrian was to abandon the late conquests of Trajan, and again to make the Euphrates the eastern boundary of the empire. While arranging the affairs of the East, Hadrian had an opportunity of pardoning some eminent citizens who were accused of hostility toward him, and after his return to Rome he confirmed his popularity by many gracious acts. Modestly declining the honors heaped upon himself, he carefully rendered the last offices to the deceased emperor, and considerably lightened the burdens of the citizens. During an absence in Mœsia, where had gone to compose some troubles with the Sarmatæ and Roxolani, a formidable conspiracy was formed against him. The details are obscure; but four consular men, among the most eminent of Rome, were accused of being concerned in it, and were put to death. Some, however, went so far as to say that the conspiracy was a scheme devised by Hadrian for getting rid of dreaded rivals. It was a dark transaction which threw a suspicion on his character. On his return to Rome he exerted himself to undo the evil effects of it by a generous and popular policy. He was liberal to the body of the people, granting them a large donation of money, remitting the arrears of taxes for the last fifteen years, and increasing the funds which Trajan had devoted to the alimentation

of poor children. He saw that the period of conquest was past, that an extension of the frontiers would only weaken the defensive power of the empire, that the time for consolidation and for softening the distinction between Rome and the provinces was come. Leaving Rome in 119, he visited probably every province of the empire. After traversing Gaul he inspected the legions on the Rhine, and then crossed to Britain, where he built (121) the great rampart from the Tyne to the Solway which bears his name. He returned through Gaul into Spain, and then proceeded to Mauritania, where he suppressed an insurrection. We next find him in the East averting a war with Parthia by a timely interview with the king. From the Parthian frontier he traveled through Asia Minor and the islands to Athens, where he sojourned a considerable time, and so returned by Sicily to Rome, having made the circuit of the empire. After some stay at Rome he resumed his travels. It is impossible to fix the details of this second progress with any exactness. It was chiefly in the East; and he did not finally return to Rome till 134. Everywhere he left lasting traces of his restless and beneficent energy; he built aqueducts and temples, and raised fortifications in suitable places; he inspected the details of the administration, learned to know the officials, and made himself at home in the military encampments. Athens was the favored scene of his architectural labors; he added a new quarter to the city, and finished the temple of the Olympian Zeus. While Hadrian spent his life in inspecting the provinces, and was not disinclined to purchase peace by a subsidy to the restless tribes of the frontiers, he did not neglect the army. All along the frontier his legions stood in constant preparation for battle. He maintained a rigorous discipline; the rules he drew up for the army long served as a kind of military code. The only important war in which this army was tested was the great rebellion of the Jews, which broke out in 131, and lasted for several years. The founding of a Roman colony on the site of Jerusalem, and an order of Hadrian forbidding the rite of circumcision, were the causes of the war. The Jews fought with the most resolute despair, and they were crushed only by a powerful army commanded by the best general of the empire. According to Dion, 580,000 Jews fell in battle. He built for his residence the great villa of Tibur, which was eight miles in circuit, and was a kind of epitome of the world, with miniatures of the most celebrated places in the provinces, and even of Hades. He built a splendid mausoleum, which became the nucleus of the castle of St. Angelo, and rebuilt several edifices at Rome. In these years he had to choose a successor. His first choice was Ælius Verus, who did nothing to justify such a distinction. The next was Antoninus Pius, so called from the filial assiduity with which he cherished the last days and the memory of his adopted father. Antoninus saved him from suicide, to which his physical sufferings impelled him, and from imbruing his hands in the blood of many noble Romans, who had provoked his moody and fickle temper. Hadrian died at Baïæ, 138 A.D.

HADRIAN, WALL OF. Under this heading it seems most convenient to give a short account of the stone wall and other works erected by the Romans in the north of England between the Solway and Tyne, and commonly known as the Roman Wall.

Viewed as a whole the Roman Wall, when entire, consisted of three parts: (1) a stone wall, strengthened by a ditch or fosse, at a short distance from its northern base; (2) three parallel earthen walls, with a ditch sloping down from the northern side of the second of these lines; (3) stations, castles and turrets, placed at various intervals for the accommodation of troops, and communicating with one another by a military way. The

Murus or stone wall extended from Wallsend on the Tyne to Bowness on the Solway Firth, a distance of fully 73 English miles. No portion of it now remains as when finished, so that its original height cannot be accurately determined. Bede gives twelve feet, an estimate that our chief modern authority on the wall, Dr. J. Collingwood Bruce, deems too low, for some parts of its course at least. Its thickness varies, being six feet in some places and nine and a half in others.

The northern face of the wall was continuous, but the southern had numerous outsets and insets, as if portions of the work had been carried on at the same time but without definite instructions as to a uniform breadth. Both sides consisted of blocks of freestone eight or nine inches thick, ten or eleven broad, and from fifteen to twenty long. These had been sometimes quarried near the spot, sometimes brought from considerable distances. Along the whole length of its northern base, and adding greatly to its strength as a defensive work, was drawn a ditch or fosse of varying breadth and depth, thirty-six and fifteen feet respectively being probably its average dimensions. In some places the difficulties to be overcome by its excavators, owing to the rocky nature of the soil, must have been enormous in an age when blasting with gunpowder was unknown. But none of them have been shunned.

Several of the ancient writers allude to ramparts and lines of forts raised by the Romans across the island during the time they had a footing in it. Of these notices some refer to the barrier on the isthmus of the Forth and Clyde; the others probably apply to the more important works now described.

HADRUMETUM, or ADRUMETUM (the name appears in the Greek writers in a great variety of forms), a city on the African coast of the Mediterranean on the Sinus Neapolitanus or Gulf of Hamamet.

HÆMORRHOIDS (from *αἷμα*, blood, and *ῥέω*, to flow), commonly called piles, a frequent and distressing malady. Two varieties are described. The external pile is an overgrowth of the thin dark-colored skin round the opening; there is most frequently more than one present; the skin, lax and redundant, hangs in folds. The internal pile lies altogether within the opening, although it may appear externally protruding through the anus when any pressure from above is applied, as when the patient strains at stool. There may be several internal piles. The internal pile is sessile or pedunculated. The external pile is of a pale color. The internal pile is moist, vascular and of a cherry-red color; is apt to inflame, and the inflammation is associated with heat, pain, and general uneasiness. Ulceration and bleeding are common symptoms of the internal pile, hence the term "bleeding" or "bloody piles." Any cause which, by pressing on the large abdominal veins, retards the upward flow of blood to the heart, will give rise to piles; such are constipation, diseases of the liver, pregnancy. The exciting cause is frequently exposure to damp, as from sitting on the wet ground. The local treatment is palliative or radical. The palliative treatment consists in attention to the state of the bowels, cold bathing, astringent (tannic acid, nutgalls, hydrastis, etc.) injections, lotions, and ointments. The radical treatment consists in their removal (which should be attempted only by a thorough surgeon). Radical treatment should not be undertaken until palliative treatment has failed. When in a state of inflammation the treatment consists in hip baths, hot fomentations, and poultices. The introduction of a morphia suppository often relieves the uneasiness. Both varieties are often met with in the same individual. The internal piles are apt to return if the predisposing cause is still in existence, and for this reason the stool should be carefully

watched and the return of costiveness prevented. There is a form of pile situated just at the verge of the anus, where the skin joins the mucous membrane: its onset is sudden, and due to the rupture of a blood-vessel; the blood is extravasated and clots; a small, tense, painful swelling of a bluish color is seen at the edge of the anus. This may be relieved by hot fomentations, or the pile may be laid open and the clot turned out by gentle pressure.

HAFIZ. Muhammed Shamsuddin, better known by his *nom de plume* of Háfiz, was one of the most celebrated writers of Persian lyrical poetry. He was born at Shiraz, the capital of Fars, in the early part of the eighth century of the Mahometan era, that is to say, in the fourteenth of our own. The exact date of his birth is uncertain, but he is known to have attained a ripe old age, and to have died in 791 A.H. (1388 A.D.) Very little is actually known about his life, which appears to have been passed in quiet retirement and literary ease in his native city of Shiraz, of which he always speaks in terms of affectionate admiration. He was a subject of the Muzaffar princes, who ruled in Shiraz, Yazd, Kirman and Ispahan, until the dynasty was overthrown by Timur-lang (Tamerlane). Of these princes his especial patrons were Shah Shujá and Shah Mansúr. The restraints of an ascetic life seem to have been very little to Háfiz's taste, and his loose conduct and wine-bibbing propensities drew upon him the severe censure of his monastic colleagues. In revenge he satirizes them unmercifully in his verses, and seldom loses an opportunity of alluding to their hypocrisy and religious pretensions. Háfiz's fame as a poet was soon rapidly spread throughout the Mahometan world, and several powerful monarchs sent him presents and pressing invitations to visit them. Among others he was invited by Mahmúd Shah Bahmani, who reigned in the south of India, and set off with the intention of sojourning at the court of that sovereign. After crossing the Indus, and passing through Lahore he reached Hurmuz, and embarked on board a vessel sent for him by the Indian prince. He seems, however, to have been a bad sailor, and, having invented an excuse for being put ashore, made the best of his way back to Shiraz. He was, like most Persians, a Shiah by religion, believing in the transmission of the office Imám, or head of the Muslim church in the family of Ali, cousin of the prophet, and rejecting the *Hadith*, or traditional sayings of Mahomet, which form the Sunneh or supplementary code of Mahometan ceremonial law.

His principal work is the *Díván*, that is, a collection of short odes or sonnets called *ghazals*, and consisting of from five to sixteen *baitis* or couplets each, all the couplets in each ode having the same rhyme in the last hemistich, and the last couplet always introducing the poet's own *nom de plume*. The whole of these are arranged in alphabetical order, an arrangement which certainly facilitates reference, but makes it absolutely impossible to ascertain their chronological order, and therefore deteriorates from their value as a means of throwing light upon the growth and development of his genius or the incidents of his career. These "orient pearls at random strung," as a version of a passage from Háfiz, in Sir William Jones' grammar, calls them, are often held together by a very slender thread of continuous thought, and very few editions agree exactly in the order of the couplets which form the individual *ghazals*.

HAGEDORN, FRIEDRICH VON, one of the most distinguished German poets in the earlier half of last century, was born April 23, 1708, at Hamburg, where his father was Danish minister at the court of Lower Saxony. The father, a man of scientific and literary tastes, possessed a valuable library of French literature.

and dabbled also in alchemy. Having, by this and other means, lost a great part of his fortune, he died in 1722, leaving in poor circumstances a widow and two sons, of whom the poet was the elder. The boy was educated at the gymnasium of Hamburg, and went later (1726) to study jurisprudence at Jena. Shortly after his return to Hamburg, in 1729, he obtained the appointment of private secretary, without salary, to the Danish ambassador in London, where he lived till 1731, and published two small works in English. In 1733 Hagedorn became secretary to the so-called "English court" in Hamburg, a trading company founded in the thirteenth century, and formerly known as "Die Societät der Aventureur Kaufleute." He shortly afterward married, and, from this time, with a settled income and sufficient leisure to pursue his literary occupations, led a pleasant and congenial existence, surrounded by friends and admirers, till his death, at the early age of forty-seven, October 28, 1755.

HAGEN, a town of Prussia, at the head of a circle in the Arnsberg government of Westphalia, is situated at the confluence of the Empe with the Volme, and at the junction of several railways, twenty-six miles west-southwest from Arnsberg. It is the seat of a provincial office, a circle court, a chamber of commerce, a state railway commission, and an agricultural union. Population (1901), about 31,000.

HAGEN, FRIEDRICH HEINRICH VON DER, distinguished for his researches in Old German literature, was born at Schmiedeberg in Brandenburg, February 19, 1780. In 1810 he was appointed professor extraordinary of German language and literature in the university of Berlin, in the following year was transferred to a similar professorship in Breslau, and in 1821 returned to Berlin as professor ordinarius. He died at Berlin, June 11, 1856.

HAGENAU, the chief town of a circle and canton in Alsace-Lorraine, Germany, district of Lower Alsace, is situated in the middle of the Hagenau forest, on the Moder, and on the railway from Strasburg to Weissenburg. Population about 13,000.

HAGENBACK, KARL RUDOLF, distinguished as a church historian, was born March 4, 1801, at Basel. His preliminary education was received at a Pestalozzian school, and afterward at the gymnasium, whence in due course he passed to the newly reorganized local university. The years 1820-1823 were spent first at Bonn, where Lücke exerted a powerful influence on the formation of his opinions, and afterward at Berlin, where Schleiermacher, and still more Neander, became permanently his masters. Returning in 1823 to Basel, he became professor extraordinary, and in 1829 professor ordinarius of theology. Apart from his special academic labors during many years in connection with the history of dogma and the church (which first owed to him their recognition as distinct branches of study at Basel), he lived a life of great and varied usefulness as a theologian, a preacher, and a citizen; and at his "jubilee" in 1873, not only the university and town of Basel, but also the various churches of Switzerland, united to do him honor. He died at Basel, June 7, 1874.

HAGERSTOWN, a Maryland city, the county seat of Washington county, is situated on Antietam creek, eighty-five miles from Baltimore. It is of some importance as a railway center, and has good banking and telegraph facilities. Its manufactures are considerable, comprising machinery, leather, flour and bricks. It contains several educational institutions and an ample quota of churches. Population (1900), 13,591.

HAG-FISH, GLUTINOUS HAG, or BOREZ (*Myxine*), a marine fish, which forms with the lampreys, one of

the lowest orders of vertebrates (*Cyclostomata*). It is occasionally found in the North Atlantic.

HAGGAI, the tenth in order of the minor prophets. The book of Haggai contains four short prophecies, delivered between the first day of the sixth month and the twenty-fourth day of the ninth month—that is, between September and December—of the second year of Darius the king. The king in question must be Darius Hystaspis, who came to the throne 521 B.C. The language of the prophet suggests the probability that he was himself one of those whose memories reached across the seventy years of the captivity, and that his prophetic work began in extreme old age. This supposition agrees well with the shortness of the period covered by his book, and with the fact that Zechariah, who began to prophesy in the same autumn, and was associated with Haggai's labors (Ezra v. 1), afterward appears as the leading prophet in Jerusalem (Zechariah vii. 1-4). We know nothing further of the personal history of Haggai from the Bible.

HAGUE, THE, a town of the Netherlands, in the province of South Holland, thirteen miles northwest of Rotterdam, ten miles southwest of Leyden, and two miles inland from the German ocean. It is connected with both Rotterdam and Leyden by the "Holland Railway," and with Utrecht by the railway of the Rhine. Besides being the chief town of the province, the Hague is the usual residence of the court, and the seat of the government, the states-general, the high council of the Netherlands, the council of state, the chamber of accounts, and various other administrative bodies. The characteristics of the town are quite in keeping with its political position. It is the handsomest, the most fashionable, and the most modern looking town in the Netherlands. D'Amicis rightly describes it in his *Olanda* as half Dutch half French. The center of the Hague, both historically and topographically, is the buildings of the court. The oldest portion was founded by Count William II., "king of the Romans," in 1249. A handsome Gothic building, with towers at each corner of the façade, contains the great or knights' hall, a noble chamber 130 feet in length, sixty-two feet in breadth, and sixty-nine in height, in which the states of the Netherlands abjured their allegiance to Philip II. of Spain, and in front of which the gray-headed Olden-Barneveldt lost his life in 1619. To the southeast of the hall is the troonzaal, or throne room, in which the second chamber of the states-general holds its sittings; and to the west is the meeting place of the first chamber. The royal palace proper was purchased by the states of the Netherlands in 1595, rebuilt by Prince William III., and extended by King William I. The palace of the prince of Orange was founded about 1720 by Count Unico William of Wassenaar Twiekels; the Palace of Prince Frederick of the Netherlands dates from 1825 to 1828; the palace of Prince Henry was erected in 1743 for the deputies of Rotterdam; and the palace of Prince Alexander was in the seventeenth century the house of John de Witt, pensionary of the council. Among the public institutions of the Hague the following are the most important: The royal library, with upward of 100,000 volumes, the Museum Meermanno-Westreenianum, the royal picture gallery in the Prins-Mauritz-Huis, the Vijverberg hôtel, with a collection of curiosities; the town museum of antiquities and modern art; the zoological gardens, founded in 1862; the royal school of design and music; and the new buildings for the arts and sciences, erected in 1874.

The principal industries of the town are iron-casting, copper and lead smelting, cannon-founding, the manufacture of furniture and carriages, silk-dyeing, liqueur-

distilling, lithographing, and printing. The population (1901) was 212,211.

The Hague, mentioned as early as 1097 in a document by Count Floris II., seems originally to have been a shooting lodge of the counts of Holland. Under William II. it became a residence of the court; and in the fifteenth century it begins to be called a town, though for long after, down even to the time of Louis Napoleon, it was as frequently described as a village. In 1479 the soldiers of Maximilian of Austria put the place to ransom; in 1525 it was the scene of the martyrdom of Johannes Pistorius (Jan de Bakker of Woerd); in 1528 it was plundered by the people of Guelderland; and in 1572, 1573 and 1574 it was laid waste by the Spaniards. Restored by William I. in 1576, it was in 1584 the seat of the sessions of the States of Holland. In 1672 it was the scene of the famous assassination of the brothers De Witt. It was at the Hague that the convention was arranged in 1710, between the German emperor, the king of Prussia, the emperor of Russia, and the maritime powers, for the maintenance of the neutrality of North Germany; it was at the Hague that the Triple Alliance of 1717 was concluded, and that the peace of the same year was signed between Spain, Savoy and Austria. From 1782 to 1787 the town had its full share in the civil disturbances of the country. In 1808 it was made the seat of the Government administrative offices.

HAHN, AUGUST, German Protestant theologian, was born March 27, 1782, near Eisleben, Saxony, and entered the university of Leipsic as a student of theology in 1810. After holding an educational appointment in Wittenberg for some time, in 1816 he was nominated professor extraordinarius of theology at Königsberg, and in the following year received a pastoral charge and a superintendency in that city. These posts, however, he soon resigned on his promotion in 1821 to be professor ordinarius. In 1826 he removed as professor of theology to Leipsic. In 1833 Hahn was called to Breslau as theological professor and consistorial counselor, and in 1844 he became general superintendent of the province of Silesia. He died at Breslau, on May 13, 1863.

HAHN, JOHANN GEORG VON, an Austrian traveler, to whom we are indebted for most of our knowledge about the Albanians, was born at Jena in 1810, and died in 1869.

HAHNEMANN, SAMUEL CHRISTIAN FRIEDRICH (1755-1843), the founder of the homeopathic system of medicine, was born at Meissen, in Saxony, April 10, 1755. He studied first at the Elector's school of Meissen, and afterward as a student of medicine at Leipsic and Vienna. He took the degree of M.D. at Erlangen in 1779, and after acting as physician at various places returned in 1789 to Leipsic, where he largely occupied himself in the translation of medical works. While working at Cullen's *Materia Medica*, he was struck by the contradictory accounts given of the properties of Peruvian bark. He had previously meditated much on the unsatisfactory nature of the science of medicine; and, after much reflection and many experiments, he became convinced of the truth of the principle *similia similibus curantur* (see HOMŒOPATHY), i.e., the cure for a disease is the very drug that would in a healthy person produce the symptoms of such disease. Further experiments convinced him that the conventional doses produced symptoms of unnecessary and dangerous violence, and this led to another principle, that of minimum doses, according to which the benefit to be derived from a medicine can be fully obtained by the administration of a very small quantity. Firmly convinced of the truth of these principles, Hahnemann spent the rest of his life

in making them known to the world. He encountered much opposition, and in 1821 was forced to leave Leipsic, as he was not allowed to dispense his own prescriptions. The grand duke of Anhalt-Köthen, however, appointed him his physician, and at Köthen he resided till 1835, when he removed to Paris. He died July 2, 1843. Hahnemann was a man of remarkable courage and perseverance. He not only sacrificed his immediate interests for the sake of his convictions, but made many painful experiments upon his own person.

HAIDARABAD. See HYDERABAD.

HAIDINGER WILHELM VON, a mineralogist, geologist and physicist of considerable note, was born at Vienna, February 6, 1795. In 1822 Haidinger visited France and England with Count Breunner, and, journeying northward, took up his abode in Edinburgh. He translated into English, with additions of his own, Mohs' *Grundriss der Mineralogie*, published at Edinburgh in three volumes under the title, *Treatise on Mineralogy*, 1825. After a tour in Northern Europe, including the Scandinavian mining districts, he undertook the scientific direction of the porcelain works at Elnbogen, belonging to his brothers. In 1840 he was appointed counselor of mines (Bergrath) at Vienna in the place of Professor Mohs, a post which includes the charge of the imperial cabinet of minerals, etc. He devoted himself to the rearrangement and enrichment of the collections, and the cabinet became the first in Europe. Shortly after (1843) Haidinger commenced a series of lectures on mineralogy. On the establishment of the imperial geological institution, he was chosen director (1849); and this important position he occupied for seventeen years. On the completion of the geological survey of the Austrian dominions, in 1862, he superintended the preparation of the maps which were issued. He was elected a member of the imperial board of agriculture and mines, and a member of the imperial academy of sciences of Vienna. He organized the society of the friends of natural sciences. As a physicist Haidinger ranked high, and he was one of the most active promoters of scientific progress in Austria. He was the discoverer of the interesting optical appearances which have been called after him "Haidinger's brushes." Knighted in 1865, the following year he retired to his estate at Dornbach, near Vienna, where he died March 19, 1871.

HAILE. See METEOROLOGY.

HAILES, SIR DAVID DALRYMPLE, BART., LORD, an eminent Scottish lawyer and historian, was born at Edinburgh, October 28, 1726. As a pleader, he attained neither high distinction nor very extensive practice, but he rapidly established a well-deserved reputation for sound knowledge, unwearied application, and strict probity; and in 1766 he was elevated to the bench, when he assumed the title of Lord Hailes. Ten years later he was appointed a lord of justiciary. His death took place on November 29, 1792.

HAINAN, or, as it is usually called in Chinese, *Kiung-chow-foo*, an island belonging to the Chinese province of Kwang-tung, and situated between the Chinese Sea and the Gulf of Tong-king. It measures 160 miles from northeast to southwest, and the average breadth is about ninety miles. The area is estimated from 1,200 to 1,400 square miles, or two-thirds the size of Sicily. From the peninsula of Lei-chow on the north it is separated by the straits of Hainan, which have a breadth of fifteen or twenty miles.

With the exception of a considerable area in the north, and broad tracts on the northeast and northwest sides, the whole island is occupied by jungle-covered mountains, with rich valleys between. Snow falls so rarely that its appearance in 1684 is reported in the native

chronicles as a remarkable event. Earthquakes are a much more familiar phenomenon. Excellent timber of various kinds—eagle-wood, rose-wood, liquidambar, etc.—is one of the principal products of the island, and has been transported to Peking for imperial purposes. The cocoa palm flourishes freely even in the north, and is to be found growing in clumps with the *Pinus sinensis*. Rice, cotton, sugar, indigo, cinnamon, betel-nuts, sweet potatoes, ground-nuts, and tobacco are all cultivated in varying quantities. The original inhabitants collect a kind of tea called tein-cha, or celestial tea, which looks like the leaves of a wild camellia, and has an earthy taste when infused. Lead, silver, copper, and iron occur in the Shih-luh-Shan or "stone-green-hill;" the silver at least was worked till 1850, and the copper would probably pay for its exploitation. Gold and lapis lazuli are found in other parts of the island.

Hainan, as already indicated, forms a foo or department of the province of Kwang-tung, though strictly it is only a portion of the island that is under Chinese administration, the remainder being still occupied by unsubjugated aborigines. The capital Kiung-chow-foo is situated in the north about ten li (or three miles) from the coast on the river. It is a well-built compact city, and its temples and examination halls are in good preservation. The population is frequently stated at 200,000, but according to C. C. Stuhlmann in the *Globus* for 1876, it is only 100,000.

The inhabitants of Hainan may be divided into three classes, the Chinese immigrants, the civilized aborigines or Shu-li, and the wild aborigines or Sheng-li. The whole population of the island is estimated at about two and one-half millions. At its first conquest 23,000 families were introduced from the mainland. In 1300 the Chinese authorities assign 166,257 inhabitants; in 1370, 291,000; and in 1617, 250,524; and now, 1,350,000.

HAJNAU (officially HAYNAU), a town in the Prussian province of Silesia, circle of Goldberg-Hainau and government district of Liegnitz, is situated on the Rapid Jeichsel and on the railway from Breslau to Dresden, twelve miles northwest of Liegnitz. Population, 6,000.

HAJNAULT, one of the nine provinces of the kingdom of Belgium, bounded east and north by Namur, Brabant, and Flanders, which are also Belgian provinces, and to the south and west by the French department du Nord. Hainault is well-wooded and hilly in the east and southeast, where it is partly covered by the Ardennes; the rest of the province is a pleasantly diversified, fertile, and well-cultivated plain land, which produces all kinds of cereal crops, flax, tobacco, chicory, and beetroot. The long and narrow coal-field which, with some breaks, stretches from Aix-la-Chapelle to the sea near Boulogne, passes through the middle of Hainault, underlying a district of about 190,000 acres; its center is about Mons, whence it extends westward to Valenciennes, eastward to Charleroi. Pop. (1901), 1,142,954.

HAJNBURG, or HAJNBURG, a town of Austria, in the circle of Bruck, situated on the Danube, twenty-seven miles east-southeast of Vienna; is the seat of a district court of justice and of a tax office. It occupies part of the site of the old Celtic town Carnuntum, destroyed 251 A.D. Present population, 5,000.

HAJNICHEN, a town of Saxony, in the circle of Leipzig and the prefecture of Döbeln, is situated on the little Striegis, fifteen miles northeast of Chemnitz.

HAIR is a substance which, from its various properties, and differences in stoutness, length, and strength, enters into a considerable variety of manufactures. Bristles are the stout elastic hairs obtained from the backs of certain breeds of pigs. The finest qualities, and the greatest quantities as well, are obtained from Russia, where a variety of pig is reared principally on

account of its bristles. The best and most costly bristles are used by shoemakers, secondary qualities being employed for toilet and clothes-brushes, while inferior qualities are worked up into the commoner kinds of brushes used by painters and for many mechanical purposes. For artists' use and for decorative painting, brushes or pencils of hair from the sable, camel, badger, polecat, etc., are prepared. The hair of various animals which is too short for spinning into yarn is utilized for the manufacture of felt. For this use the hair of rabbits, hares, beavers, and of several other rodents is largely employed, especially in France, in making the finer qualities of felt hats. Cow hair, obtained from tanneries, is used in the preparation of roofing-felts, and felt for covering boilers and steam-pipes, and for other similar purposes. It is also largely used by plasterers for binding the mortar of the walls and roofs of houses, and of late years it has to some extent been woven up into coarse friezes, horse-cloths, railway rugs, and inferior blankets. The tail hair of oxen is also of value for stuffing cushions and other upholstery work, for which purpose, as well as for making the official wigs of law officers, barristers, etc. The tail and body hair of the yak or Thibet ox is also sometimes imported into Europe. The tail and mane hair of horses is in great demand for various purposes. The long tail hair is especially valuable for weaving into hair-cloth, mane hair and the short tail hair being, on the other hand, principally prepared and curled for stuffing the chairs, sofas, and couches which are covered with the cloth manufactured from the long hair. The horse hair used in Great Britain is principally obtained from South America, Germany, and Russia, and its sorting, cleaning, and working up into the various manufactures dependent on the material are industries of some importance. In addition to the purposes already alluded to, horse hair is woven into crinoline for ladies' bonnets, plaited into fishing lines, woven into bags for oil and cider pressers, and into straining cloths for brewers, etc., and for numerous other minor uses. The manufactures which arise in connection with human hair are more peculiar than important, although occasionally fashions arise which cause a large demand for human hair. The fluctuations of such fashions determine the value of hair; but at all times long tresses are of considerable value. Gray, light, pale, and auburn hair are distinguished as extra colors, and command much higher prices than the common shades. The value of hair also increases very rapidly with increase in length. Thus while eight-inch hair sells at about 1 shilling per ounce, thirty-six-inch hair will command a price as high as 30 shillings per ounce. Lengths beyond thirty-six inches are exceptional and command fancy prices, the standard length in the hair trade being eighteen inches. The light colored hair is chiefly obtained in Germany and Austria, and the south of France is the principal source of the darker shades. In the south of France the cultivation and sale of heads of hair by peasant girls is a common practice, and hawkers attend fairs for the special purpose of engaging in this traffic. Hair five, and even six feet long, is sometimes obtained. Scarcely any of the "raw material" is obtained except in the form of ladies' "combs." Bleaching of hair by means of peroxide of hydrogen is now extensively practiced, with the view of obtaining a supply of golden locks, or of preparing white hair for mixing to match gray shades; but in neither case is the result very successful. Human hair is worked up into a great variety of wigs, scalps, artificial fronts, frizzets, and curls, all for supplementing the scanty or failing resources of nature. The plaiting of human hair into articles of jewelry, watch-guards, etc., forms a distinct branch of trade.

HAIRBELL. See HAREBELL.

HAIR-TAIL (*Trichiurus lepturus*), a marine fish, with a long band-like body terminating in a thread-like tail, and with strong prominent teeth in both jaws. Several species are known.

HAITI. See HAYTI.

HAJDÚK, sometimes corrupted into HEYDUKE, is the plural form of the Magyar word Hajdú, and was formerly used as the collective name of the undermentioned towns (along with Vámos-Pécs, population, 3,000) of the old privileged Hajdúk district of Hungary, now included in the county of Hajdú.

HAJDÚ BÖSZÖRMÉNY, the second town in importance of Hajdú county, lies about eleven miles to the northwest of Debrecin. Population, 19,208.

HAJDÚ DOROG is a market town situated about ten miles to the north of Bösörmény. Population, 8,200.

HAJDÚ HADHÁZ is a corporate town lying about ten miles north of Debrecin. Population, 7,024.

HAJDÚ NÁNÁS is a market town, about twenty, four miles north-northwest of Debrecin. Population, 13,198.

HAJDÚ-SZOBOSZLO is a corporate town, twelve miles to the southwest of Debrecin. Population, 12,269.

The Hajdúk district was made over to the Hajdúks in 1605, with special privileges and the rights of nobility, by the Transylvanian prince Stephen Bocskay, as a reward for military service rendered him in his revolutionary campaigns. The inhabitants were confirmed in their possessions by the diet of 1613. It now forms the principal portion of the new county of Hajdú, constituted in 1876, and including, along with the old Hajdúk district, portions of the neighboring counties of Szabolcs and Bihar. Debrecin is the capital, and the population is computed at about 163,000, mostly Magyars.

HÁJÍPUR, a municipal town in Muzaffarpur district, Bengal, situated on the east bank of the Gandak, a short distance above its confluence with the Ganges opposite Patná. The population numbers 22,306.

HAIJI KHALFA. Mustafa 'bn Abdallah, Kátib Chelepi, commonly known as Haji (or Hadji) Khalfa (more properly Háji Khalifah), was the author of an encyclopædia in Arabic of Oriental biography and bibliography. He was born at Constantinople about the beginning of the seventeenth century of the Christian era, and died in 1658.

HAKE (*Mertuicinus vulgaris*), a fish belonging to the family of cod-fishes (*Gadidae*), differing from the common cod in having only two dorsal and one anal fin. It is very common on the coasts of Europe and Eastern North America, but its flesh is much less esteemed than that of the true *Gadi*. Specimens four feet in length are not scarce. A closely allied fish inhabits the coasts of Chili and New Zealand.

HAKIM, or, as the full title runs, EL HAKIM BI-AMRILLAH ABOO 'ALEE MANSOOR (985-1020), the sixth of the Fatimite caliphs, and the third of that dynasty ruling in Egypt, founder of the sect of the Druses, was born in 985 A.D., was designated heir apparent in 993, succeeded in 996, and died in 1020.

HAKLUYT, RICHARD, geographer, was born in or near London about 1553. Entering Christ Church, Oxford, in 1570, he fell to his intended course of reading, and by degrees perused all the printed or written voyages and discoveries that he could find. He took his degree of B.A. in 1573-74, and we learn from the Towneley MSS. that two years later he was selected twice in the same year to receive gifts of money. It is highly probable that, shortly after taking his degree of M.A. (1577), he commenced at Oxford the first public lectures in geography that "shewed both the old im-

perfectly composed and the new lately reformed mappes globes, spheres, and other instruments of this art."

Hakluyt's first published work was his *Divers Voyages touching the Discoverie of America*. By reason of his great knowledge of these matters and his acquaintance with "the chiefest captains at sea, the greatest merchants, and the best mariners of our nation," he was selected in 1583, at the age of thirty, to accompany Sir Edward Stafford, the English ambassador, to Paris in the capacity of chaplain. In accordance with the instructions of Secretary Walsingham, he occupied himself chiefly in collecting information of the Spanish and French movements. The first fruits of Hakluyt's labors in Paris are embodied in the most important production of his that has seen the light in modern times; it is entitled *A particular discourse concerning Westerne discoveries written in the yere 1584, by Richard Hakluyt of Oxforde*.

Hakluyt returned to England in 1584, and during his short stay he had the honor of laying before Queen Elizabeth a copy of the *Discourse* "along with one in Latin upon Aristotle's *Politicks*, which won for him, two days before his departure again for Paris, the grant of the next vacant prebend at Bristol. In the spring of the following year, feeling anxious about the reversion of the prebend, he again visited England, and exhibited in person, on May 24, 1585, before the chapter of Bristol cathedral, the queen's mandate for the coveted vacancy already signed and sealed. Before the close of the year the reversion of it fell to him, and in 1586 he was admitted to the prebend, which he held with his other preferments, till the time of his death in 1616.

IIAKODADI, or HAKODATE, a seaport town of Japan, in the old province of Hokukaido, on the southern coast of the island of Zezo or Yesso. Its general position, as has been frequently remarked, is not unlike that of Gibraltar, as the town is built along the north-western base of a rocky promontory which forms the eastern boundary of a spacious bay, and is united to the mainland by a narrow sandy isthmus. It was opened to American commerce in 1854; and there are now also Danish, German and English consuls. In 1868 the town was taken by the rebel fleet, but it was recovered by the Mikado in 1869. Pop. (1898), 78,040.

HAL, a town of Belgium, province of South Brabant, is situated on the Senne and the Charleroi canal, nine miles south-southwest of Brussels. It has a beautiful Gothic church of the fourteenth century, very much resorted to by pilgrims on account of a famous miracle-working image of the Virgin. Population, 7,000.

HALA, or HALLA (formerly known as Murtizábád), a town in Hyderabad district, Sind, India, situated on the Aliganj canal. Population, 5,000.

HALAS, a corporate town of Hungary, in the megye or county of Pest-Pilis-Solt-Kis-Kun, is situated about seventy-six miles south-southeast from Budapest. Population (1890), 150,000.

HALBERSTADT, the chief town of a circle in the government district of Magdeburg, Prussian province of Saxony, is situated on the Holzemme, a tributary of the Bode, and at the junction point of four railways, twenty-nine miles southwest of Magdeburg. It has an antique appearance, and in a large number of the buildings the mediæval wood-architecture is still preserved. The population is 28,000.

HALBERT, HALBARD, a weapon consisting of an ax-blade balanced by a pick and having an elongated pike-head at the end of the staff, which was usually about five or six feet in length. Various derivations have been suggested for the term, but M. Demmiz

seems to have hit the right one in the German *Halbbarthe*, "half battle-ax." The earliest halberts represented in the miniatures of the fourteenth century, or preserved in the collections of Switzerland and Germany, have the ax-blade often prolonged beyond the end of the staff, and thus resemble the English bill of the fifteenth century. The Lochaber ax may be called a species of halbert furnished with a hook on the end of the staff at the back of the blade.

HALDANE, JAMES ALEXANDER (1768-1851), whose disinterested labors in the cause of religion have secured for his name an honorable place in the ecclesiastical history of Scotland, was born at Dundee on July 14, 1768, and died on February 8, 1851.

HALDANE, ROBERT, elder brother of the preceding, and intimately associated with him in many of his labors, was born in London, February 28, 1764. In December, 1797, he joined his brother and some others in the formation of the "Society for the Propagation of the Gospel at Home;" and in building chapels or "tabernacles" for its congregations, in supporting its missionaries, and in maintaining institutions for the education of young men to carry on its work, he in the course of the twelve years which followed is stated on good authority to have expended upward of £70,000. In 1816 he visited the Continent, and first at Geneva and afterward in Montauban (1817) occupied himself in lecturing with surprising success to theological students, among whom were Malan, Monod, and Merle D'Aubigné. Returning to Scotland in 1819, he lived partly on his estate of Auchengray and partly in Edinburgh, and like his brother took an active part, chiefly through the press, in many of the religious controversies of the time. He died on December 12, 1842.

HALE, SIR MATTHEW, lord chief-justice of England, was born in 1609, at Alderley in Gloucestershire. Both his parents having died before he was five years old, the future chief-justice was placed by his guardian under the care of Mr. Staunton, vicar of Wotton-under-Edge, through whose influence he became strongly imbued with puritanical principles. There he remained till he attained his sixteenth year, when he entered Magdalen Hall, Oxford, under the tuition of the puritanical but learned Obadiah Sedgwick. At Oxford Hale devoted himself for several terms to the study of Aristotle and Calvin, with a view to holy orders, but on November 8, 1629, Hale became a member of the honorable society of Lincoln's Inn.

He was called to the bar in 1637, and almost at once found himself in full practice. Though neither a fluent speaker nor bold pleader, in a very few years he was at the head of his profession. He entered public life at perhaps the most critical period of English history. It has been said, but without certainty, that Hale was engaged as counsel for the earl of Strafford; he certainly acted for Archbishop Laud, Lord Maguire, Christopher Love, the duke of Hamilton, and others. It is also said that he was ready to plead on the side of Charles I. had that monarch submitted to the court. The parliament having gained the ascendancy, Hale signed the Solemn League and Covenant, and was a member of the famous Assembly of Divines at Westminster in 1644; but although he would undoubtedly have preferred a Presbyterian form of church government, he had no serious objection to the system of modified Episcopacy proposed by Usher. Hale took the engagement to the Commonwealth as he had done to the king, and in 1653, already serjeant, he became a judge in the Court of Common Pleas. Two years afterward he sat in Cromwell's parliament as one of the members for Gloucestershire. After the death of the Protector, however, he declined to act as a judge under Richard Cromwell, al-

though he represented Oxford in Richard's parliament. At the Restoration in 1660 Hale was graciously received by Charles II., and in the same year was appointed chief baron of the exchequer, and accepted the honor of knighthood. After holding the office of chief baron for eleven years he was raised to the higher dignity of lord chief-justice, which he held till February, 1676, when his failing health compelled him to resign. He retired to his native Alderley, where he died on December 25th of the same year.

HALES, STEPHEN, English physiologist and inventor, was born at Beckesbourn in Kent, on September 7, 1677. In March, 1717, he was elected fellow of the Royal Society, to whose *Transactions* he contributed many valuable papers. In 1732 he was named one of a committee for establishing a colony in Georgia, and the next year he received the degree of doctor of divinity. He was appointed almoner to the princess-dowager of Wales in 1750. On the death of Sir Hans Sloane in 1753, Hales was chosen foreign associate of the French Academy of Sciences. He died at Teddington, January 4, 1761.

He is celebrated as the inventor of a "ventilator," by means of which fresh air was introduced into jails, hospitals, mines, ships' holds, etc. The invention met with immediate favor, especially in France. Hales was the designer of other inventions by means of which sea-water was distilled, corn cleaned and preserved, meat preserved on long voyages, etc.

HALEVY, JACQUES FRANÇOIS FROMENTAL, a celebrated French musician, was born May 27, 1799, at Paris. He studied at the Paris Conservatoire under Berton and Cherubini, and in 1819 gained the grand prix de Rome with a cantata called *Herminie*. In accordance with the conditions of his scholarship he started for Rome, where he devoted himself to the study of Italian music, and wrote an opera and various minor works. His first opera produced in Paris after his return from Italy was called *L'Artisan*, which saw the light at the Théâtre Feydeau in 1827, apparently without much success. Other works of minor importance, and now forgotten, followed, among which only a ballet named *Manon Lescaut*, produced in 1830, deserves mention. Five years later, in 1835, Halévy produced the tragic opera *La Juive* and the comic opera *L'Éclair*, and on these works his fame is mainly founded. Both have kept the stage to the present day, and will probably survive changes of taste even greater than those which music has undergone in France during the last forty years. It is curious that the *grand-opéra*, although an essentially national product of France, was both initiated and brought to its highest perfection by two Germans—Gluck and Meyerbeer. The genius of the latter was fatal to Halévy's fame. By the side of the *Huguenots* the merits of *La Juive* appear in almost diminutive proportions. At the same time Halévy's work ought not to be treated with contempt. It is full of fine dramatic features, and especially the introduction of the Jewish element—with which Halévy, himself a Jew, was well acquainted—gives a peculiar interest on this score. *L'Éclair* is a curiosity of musical literature. It is written for two tenors and two sopranos, without a chorus, and displays the composer's mastery over the most refined effects of instrumentation and vocalization in favorable light. After these two works, to which Halévy owed his fame and his seat at the Institute, he wrote numerous operas of various *genres*. He died at Nice, March 17, 1862.

HALIBURTON, THOMAS CHANDLER (1796-1865), long a judge of Nova Scotia, and a popular literary satirist, was born at Windsor, Nova Scotia, in 1796,

and received his education there, at King's College. He was called to the bar in 1820, and took part in the legislature of his native province as a member of the House of Assembly. He distinguished himself as a barrister, and in 1828 was promoted to the bench as a chief-justice of the common pleas.

In politics Haliburton adhered through life to the Conservative party; and the influence of his early associations is traceable in most of his writings. He was still at the bar when he wrote *An Historical and Statistical Account of Nova Scotia*, in two volumes. In 1835 he contributed anonymously to a local paper a series of letters professionally depicting the peculiarities of the genuine Yankee. These sketches, which abounded in clever picturings of national and individual character, drawn with great satirical humor, were collected in 1837, and published under the title of *The Clockmaker, or Sayings and Doings of Samuel Slick of Slickville*. A second series followed in 1838, and a third in 1840. *The Attaché, or Sam Slick in England* (2 vols. 8vo), was the result of a visit there in 1841. This also was followed up by a second series in 1844. His other works include—*The Old Judge, or Life in a Colony; The Letter Bag of the Great Western; Rule and Misrule of the English in America; Traits of American Humor; and Nature and Human Nature*.

In 1840 he was promoted to be judge of the supreme court; but within two years he resigned his seat on the bench, removed to England, and after a time entered parliament as the representative of Launceston in the Conservative interest. The last time he spoke he was listened to with interest on the Canadian defenses. But the tenure of his seat for Launceston was brought to an end by the dissolution of parliament in 1865, and he did not again offer himself to the constituency. His death followed in the month of August of the same year.

HALIBUT. See HOLIBUT.

HALICARNASSUS, an ancient Greek city on the southwestern coast of Asia Minor, built on a picturesque and advantageous site at the northern end of the Ceramic Gulf or Gulf of Cos. It originally occupied only the small island of Zephyria, close to the shore, but in course of time this island was united to the mainland and the city extended so as to incorporate Salmacis, an older town of the Leleges and Carians. About the foundation of Halicarnassus various traditions were current; but they agree in the main point as to its being a Dorian colony.

HALIFAX, a sea port city of Nova Scotia (of which province it is the capital), is situated on the west side of Halifax harbor, an indentation in the southern coast of the Nova Scotia peninsula. The city was originally called Chebucto, but the name was changed to Halifax in 1749. It is situated on the declivity of a gradual slope or hill, the top of which is crowned by a strong citadel, while the harbor is protected by several forts and batteries. The streets are regularly laid out at right angles one with another, and contain many imposing and beautiful houses. Formerly the buildings were mostly of wood, but repeated destructive conflagrations have impressed upon the inhabitants the necessity of using fire-proof materials in the construction of houses, so that most modern erections have been of stone and brick. There are many notable public buildings, among them being the government house (the official residence of the lieutenant-governor of the province), the provincial building (in which are all the government offices), the postoffice and the museum; the parliament house, the admiralty house, the court house, the exchange, the cathedral of St. Mary's, the barracks, the city, military

and naval hospitals, insane asylum, jail and penitentiary. The higher educational establishments are represented by Dalhousie university and college, the Roman Catholic college (St. Mary's), Presbyterian (theological) college, and the high school. There are also numerous charitable educational institutions, two orphan asylums and a blind asylum. The lunatic asylum for the lower provinces is located here. The city has an Anglican bishop and Roman Catholic archbishop.

The material prosperity of the city is fostered by numerous manufactories, including in their products a very wide range of articles—some of the principal being machinery, iron goods and castings generally, soap, leather, rope, tobacco, paper, cotton and woolen goods, sugar, beer and spirituous liquors. There are also numbers of stores and warehouses, while the hotels are numerous and well appointed. The harbor is spacious and well protected, affording a safe anchorage for all the naval vessels of the different powers. The numerous lines of steamers furnish communication with all portions of the world, while its railway connection give it easy access to all parts of America. It has a mayor and a city government composed of aldermanic, magisterial and police departments.

Considerable fishing interests center here, and a large number of seagoing and coasting craft are owned by the citizens. The harbor is well lighted by the government light-houses, and the streets of the city are lighted with both gas and electricity. The city is a watering place of considerable reputation. The water supply for domestic use is abundant and excellent, being obtained from the neighboring lakes. A large proportion of the inhabitants are Roman Catholics. The city takes its present name from the earl of Halifax. Since it was declared a free port, in 1817, its growth in population and importance has been rapid. Population (1901), 40,832. The following facts are from the fiscal report for 1899: Total taxable values of the city, \$31,604,761; amount assessed, \$565,641; rate of taxation, 1.24. Total indebtedness of the city, \$1,824,742.46. The city has efficient fire, police and water departments.

HALIFAX, a municipal and parliamentary borough and market-town of England, in the northern division of the West Riding of Yorkshire. Halifax derives its importance from its manufactures of cloth, which began in the fifteenth century. It ranks in Yorkshire with Leeds, Bradford, and Huddersfield as a seat of the woolen and worsted manufacture. The principal staples are carpets, cashmeres, orleanses, coburgs, merinos, lastings, alpacas, damasks, baizes, broad and narrow cloths, kerseymeres, blankets, muslin-de-laines, shalloons, and figured vestings. A considerable number of persons are employed in iron-works, machine works, and chemical works, and in the neighboring coal-mines and stone quarries. The borough sends two members to parliament. The parish is the largest in Great Britain, embracing 79,200 acres. The population of the municipal and parliamentary borough (1901) was 104,933.

HALIFAX, CHARLES MONTAGUE, EARL OF, English statesman and poet, was born at Horton, Northamptonshire, in 1661. In 1682 he entered Trinity College, Cambridge, where he acquired a solid knowledge of the classics, and surpassed all his contemporaries at the university in logic and ethics, and he was one of the small band of students who assisted Newton in forming the Philosophical Society of Cambridge. His clever but absurdly panegyric poem on the death of Charles II., which was published in the *Book of Condolence and Congratulation* presented by the university to James II., secured for him the notice of the earl of Dorset, who invited him to town and introduced him to the

principal wits of the time; and in 1687 his joint authorship with Prior of the *Town and Country Mouse*, a happy parody of Dryden's *Hind and Panther*, not only increased his literary reputation, but directly helped him to political influence. In 1688, through the patronage of the earl of Dorset, he entered parliament as member for Maldon, and sat in the convention which resolved that William and Mary should be declared king and queen of England. In 1691 he was chosen chairman of the committee of the House of Commons appointed to confer with a committee of the Lords in regard to the bill for regulating trials in cases of high treason; and he displayed in these conferences such tact and debating power that he was made one of the commissioners of the treasury and called to the privy council. Although perhaps it was inevitable that England should sooner or later adopt the continental custom of lightening the annual taxation in times of war by contracting a national debt, the actual introduction of the expedient was due to Montague, who on December 15, 1692, proposed to raise a million sterling by way of loan. In the spring of 1694 Montague introduced a bill for the incorporation of the bank of England. The bill, after some opposition, passed the House of Lords in May, and immediately after the prorogation of parliament Montague was rewarded by the chancellorship of the exchequer. In the following year he was returned for the borough of Westminster to the new parliament. His other expedients for meeting the emergencies of the financial crisis were equally successful, and the rapid restoration of public credit secured him a commanding influence both in the House of Commons and at the board of the treasury; but although Godolphin resigned office in October, 1696, the king hesitated for some time between Montague and Sir Stephen Fox as his successor, and it was not till 1697 that the former was appointed first lord. In 1698 and 1699 he acted as one of the council of regency during the king's absence from England. In February of the former year he had been accused of peculation in connection with the issue of exchequer bills, but had been triumphantly acquitted, and his reputation was still further increased in the same year by the extraordinary popularity of his project for a new East India company. After the return of the king in 1699 he resigned his offices in the government and succeeded his brother in the auditorship. On the accession of the Tories to power he was removed in 1701 to the House of Lords, by the title of Lord Halifax. In the same year he was impeached for malpractices along with Lord Somers and the earls of Portland and Oxford, but all the charges were dismissed by the Lords; and in 1703 a second attempt to impeach him was unsuccessful. He continued out of office during the reign of Queen Anne, but in 1706 he was named one of the commissioners to negotiate the union with Scotland; and after the passing of the act of settlement in favor of the house of Hanover, he was appointed ambassador to the elector's court to convey the insignia of order of the garter to George I. On the death of Anne (1714) he was appointed one of the council of regency until the arrival of the king from Hanover; and after the coronation he received the office of first lord of the treasury in the new ministry, being at the same time created earl of Halifax and Viscount Sunbury. He died on May 15th of the following year, and left no issue.

HALIFAX, GEORGE SAVILE, MARQUIS OF, English statesman and author, was born about 1630. He succeeded to the baronetcy on the death of his father, and, having taken an active part in the Restoration, he was in 1667 created Baron Savile and Viscount Halifax. In June, 1672, he was sent to negotiate terms of peace

with France, but he was kept in ignorance of the agreement between Charles and Louis in regard to the establishment of popery in England. In 1679 he was created an earl, and having become a member of the new council after the fall of Danby, he differed from the earl of Shaftesbury and his other colleagues in reference to the Exclusion Bill, and by an extraordinary manifestation of nearly all the resources of oratory was instrumental in causing its rejection by the Lords.

In 1682 he was created a marquis and became lord privy seal. Although chiefly instrumental in securing the duke of York's succession, his proposed limitations of James' authority when the crown should devolve upon him, as well as his subsequent leaning to Whig principles, awakened the duke's settled hostility, and this was further deepened by his exposure of the malversation of the earl of Rochester. After the accession of James he was accordingly removed from the office of privy seal to that of president of the council, a less important position; and when in 1685 he refused to give his vote for the repeal either of the Test Act or of the Habeas Corpus Act, he was dismissed from the cabinet. In the Convention Parliament he was chosen speaker of the Lords, and strongly opposed the motion for a regency. He died somewhat suddenly, April 20, 1695. He was succeeded by his son William, with whose death in 1699 the title became extinct in his family. A daughter by his second marriage was the mother of the fourth and celebrated earl of Chesterfield; and from his natural son, Henry Carey the dramatist, was descended the celebrated Edmund Kean.

Halifax is portrayed in Dryden's *Absalom and Achitophel* as—

"Joatham of piercing wit and pregnant thought,
Endued by nature and by learning taught
To move assemblies."

HALL, a town in northern Tyrol, Austria, government district of Innsbruck, is picturesquely situated between two mountains on the left bank of the Inn, which is navigable there, and on the railway from Rosenheim to Innsbruck. Population about 7,000.

HALL (generally known as Swabian Hall), a town of Württemberg, circle of Jagst, is situated in a deep valley on both sides of the Kocher, thirty-five miles northeast of Stuttgart. Population about 12,000.

HALL, BASIL (1788-1844), British traveler and miscellaneous writer, was born at Edinburgh, December 31, 1788. Basil Hall was educated at the high school of Edinburgh, and in 1802 entered the navy, where he rose to the rank of post-captain in 1817. In 1816 he commanded the sloop *Lyra*, which accompanied Lord Amherst's embassy to China; and in this vessel he performed the cruise which he describes in the most popular and perhaps the most interesting of his works—*An Account of a voyage of Discovery to the West Coast of Corea and the Great Loo-choo Island in the Japan Sea* (London, 1818). In 1820 he held a command on the Pacific coast of America, and in 1824 published two volumes of *Extracts from a Journal written on the Coasts of Chili, Peru, and Mexico in the years 1820-21-22*. Retiring on half-pay in 1824, Hall in 1825 married a daughter of Sir John Hunter, and in her company traveled (1827-28) through the United States. In 1829 he published his *Travels in North America in the years 1827 and 1828*, a book almost as well-known as his first, less from its intrinsic merit than from the violence with which it was assailed by the American press for its views of American society. *Schloss Hainfeld, or a Winter in Lower Styria* (1836), is partly a romance, partly a description of a visit paid by the author to the castle of the Countess Purgstall. *Spain and the Seat of War in Spain* appeared in 1837. The *Fragments of Voyages*

and *Travels* (9 vols.) were issued in three detachments between 1831 and 1840. Captain Hall was a fellow of the Royal Societies of London and Edinburgh, and a member of the Astronomical Society of London, and left a number of scientific and miscellaneous writings besides those mentioned. His last work, a collection of sketches and tales under the name of *Patchwork* (1841), had not been long published before its author was seized with insanity, from which he was only released by his death, in Haslar Hospital, Portsmouth, September 11, 1844.

HALL, CHARLES FRANCIS, an Arctic explorer, was born at Rochester, N. H., in 1821. After following the trade of blacksmith he became a journalist in Cincinnati, but his enthusiasm for Arctic exploration led him in 1859 to volunteer to the American Geographical Society to go in search of the bones of Franklin. With the proceeds of a subscription he was equipped for his modest expedition, and obtained a passage in May, 1860, on board a New London whaling vessel, commanded by Captain Buddington, the same who had picked up the English search-ship *Resolute*. The whaler having become blocked up with ice, Hall took up his abode with the Eskimo, living with them for two years, adopting their habits and acquiring their language, making special friends of two natives, man and wife, who had been in England, and knew something of our language. He wandered about with the Eskimo in the region to the north of Hudson's Bay, acquiring much information, especially about the people. He published an account of his experiences in 1864, under the title of *Arctic Researches, and Life among the Esquimaux*. Having learned little or nothing, however, about the fate of the Franklin expedition, he returned in 1864, remaining among the Eskimo till 1869. Unfortunately, the full journal he kept of his five years' wanderings has never been published. The expedition which brought Hall most prominently into notice was fitted out in 1871, in the steamer *Polaris*, which was sent out at the expense of the United States Government, its object being to reach the supposed open Polar Sea, and if possible attain the Pole. Hall was in command, while Buddington was sailing master. There was a modest but competent scientific staff, and among the crew were Hall's two old Eskimo friends, who had become devoted to him. On June 29, 1871, the *Polaris* left New York, and making a remarkably rapid passage up Davis Straits and Smith Sound, reached on August 30th the latitude of $82^{\circ} 16' N.$, until the last English expedition the highest northern latitude reached of which there is any authentic report. Hall and most of the officers and crew were for proceeding onward, but they were overruled by Buddington, and went into winter quarters in a sheltered cove on the Greenland coast, named *Polaris Bay*, in $81^{\circ} 38' N.$ On October 24 Hall returned from a successful sleigh expedition to the north and was suddenly seized by an illness, of which he died on November 8. As there were some suspicions of poison, an inquiry was made by the navy department, who found that there was no proof of foul play. Captain Buddington, on whom the command devolved, determined in August of 1872 to return, but the *Polaris* was greatly hampered by the ice. The danger became so great that on October 15 boats and stores were put on the ice, on which nineteen of the crew had disembarked. Suddenly the ship broke away, and the party on the ice drifted slowly southward for 195 days, and were picked up off the coast of Labrador, by a whaling steamer, 2,000 miles from where they had parted with the *Polaris*. The party in the ship reached Littleton's Island, where they passed the winter, building two boats from the boards of the vessel, in which they set

sail southward in June, 1873. On the twenty-third of that month they were picked up by a Dundee whaler, and were taken to that town, from which they ultimately reached the United States. The scientific results of the unfortunate Hall's last expedition were of considerable importance, and have been published by the United States Government, as also has an independent account in German by Dr. Bessels, one of the scientific staff.

HALL, or HALLE, EDWARD, an English lawyer who takes high rank among the earlier narrators of his country's history, was born in London about the close of the fifteenth century, and died in 1547, the year of the death of King Henry VIII.

HALL, JAMES (1793-1868), an American judge and the author of a number of books chiefly relating to the Western States, was born at Philadelphia, August 19, 1793. In 1820 he removed to Shawneetown, Ill., where he commenced practice at the bar and also edited the *Illinois Gazette*. Soon after he was appointed public prosecutor of the circuit, and in 1824 became a judge. On the abolition of the latter office four years afterward he was appointed State treasurer, but he continued at the same time his legal practice and also edited the *Illinois Intelligencer*. Subsequently he became editor of the *Western Souvenir*, an annual publication, and of the *Illinois Monthly Magazine*, afterward the *Western Monthly Magazine*. He died near Cincinnati, July 5, 1868.

HALL, JOSEPH, bishop of Norwich, one of the wittiest as well as wisest writers of his century, was born at Bristow Park, Leicestershire, July 1, 1574. Having taken holy orders, he in 1601 became rector of Halstead in Suffolk, near Bury St. Edmunds. In 1612 Hall was presented to the curacy of Waltham Holy-Cross, in Essex, and about the same time received the degree of doctor of divinity. Meanwhile his talents as a preacher, and the ability shown in his controversial writings, had brought him into notice at court. He was appointed chaplain to Prince Henry and prebendary of Wolverhampton. The latter dignity he soon resigned. In 1616 Hall accompanied the earl of Carlisle on his mission to France, but was compelled by illness to return; in 1617 he went with James I. into Scotland, and in 1618 was appointed by him one of the English deputies to the Synod at Dort; but he was again forced by sickness to return before the business of the assembly was finished. The year before (1617) he had been appointed dean of Worcester. In 1624 he refused the see of Gloucester, but in 1627 became bishop of Exeter. No better proof of his attachment to the Church of England is needed than his *Episcopacy by Divine Right Asserted*, written in 1640 at the suggestion of Laud. In 1641 Hall was translated to the see of Norwich. The same year he joined eleven other bishops in presenting to parliament a protest against all laws passed in their enforced absence. Upon this the bishops were accused of high treason and thrown into the Tower. Hall, in his *Hard Measure*, relates the trials he underwent both at this time and afterward. The accusation fell to the ground, and in six months the bishops were released (June 1642), only, however, on each finding security for £5,000. Hall proceeded to Norwich, which he had not yet visited, and set about his pastoral duties; but in 1643 his revenues and personal property were sequestered by parliament, a nominal allowance of £400 a year being made for his maintenance.

HALL, MARSHALL, the discoverer of the "diastaltic nervous system," was born at Basford, Notts, February 18, 1790. His father, Robert Hall, is well known as the introducer of the modern processes of bleaching on a large scale. He graduated in medicine, and after practicing for some time and writing several medical

treatises, pursued more especially his studies of the effects of blood-letting, and his *Researches* (issued in 1830) were acknowledged by the medical profession to be of vast practical value. Much practical good also resulted from his warning against mistaking exhaustion for inflammation. Hall married in 1829, and the same year he made the discovery which placed him in rank with Harvey. It is described in *A Critical and Experimental Essay on the Circulation of the Blood in the Capillary Vessels*, in which he showed that the blood-channels intermediate between arteries and veins serve the office of bringing the fluid blood into contact with the material tissues of the system. About this time he made his original investigations on quantity of respiration, detailed in *The Inverse Ratio which subsists between the Respiration and Irritability in the Animal Kingdom*, a work which led to the treatises on hibernation. In 1831 he proposed a simple and bloodless operation for the removal of vascular naevus. His most important discovery in physiology was the "diastaltic spinal system," his views being embodied in a paper on *The Reflex Function of the Medulla Oblongata and the Medulla Spinalis*, 1832, in which year he was elected fellow of the Royal Society, London. This paper was supplemented in 1837 by another *On the True Spinal Marrow, and the Excito-motor System of Nerves*, in which he explained the real classification and distribution of the entire nervous system. Hall thus became the authority on the multiform deranged states of health referable to an abnormal condition of the nervous system, and he made plain the obscure class of convulsive affections. The action of strychnia as a spinal tonic or excitant, the relief of the epileptic, tracheotomy in laryngismal epilepsy, and the "ready method" in asphyxia, were among the later objects of his investigation. His "ready method"—sometimes called Marshall Hall's method—for resuscitation in drowning and other forms of suspended respiration—is perhaps the most popular of his discoveries; by it innumerable lives have been preserved. Doctor Hall lectured at various medical schools, at the College of Physicians, and also at New York during his American tour. His papers in medical and scientific journals, including the *Comptes Rendus*, are remarkable for lucidity and brevity. He died at Brighton of a throat affection, aggravated by lecturing, August 11, 1857.

HALL, ROBERT, one of the greatest of English pulpit orators, was born May 2, 1764, at Arnsby near Leicester. On August 13, 1780, he was set apart to the ministry, and in 1781, in accordance with the provisions of an exhibition which he held, he entered King's College, Aberdeen, where he took the degree of master of arts in March, 1785. At the university he was without a rival of his own standing in any of the classes, distinguishing himself alike in classics, philosophy and mathematics. July, 1790, he accepted an invitation to make trial of a congregation at Cambridge, of which he became pastor in July of the following year. It was during his Cambridge ministry, which extended over a period of fifteen years, that his oratory was most brilliant and most immediately powerful. In 1793 he expounded his political sentiments in a powerful pamphlet entitled an *Apology for the Freedom of the Press*, which at once obtained an extensive circulation, and doubtless to some extent aided in the formation of that public opinion which has given birth in England to the present remarkable era of gradual and unswerving political progress. From his first attack of insanity, which occurred in November, 1804, he recovered so speedily that he was able to resume his duties in April, 1805, but a more severe recurrence of the malady rendered it advisable for him on his second recovery to re-

sign his pastoral office, which he did in March, 1806. On leaving Cambridge he paid a visit to his relatives in Leicestershire, and then for some time resided at Enderby, preaching occasionally in some of the neighboring villages. In the autumn of 1807 he changed his residence from Enderby to Leicester, and in 1808 he married the servant of a brother minister. His proposal of marriage had been made after an almost momentary acquaintance, and, according to the traditional account, in very abrupt and peculiar terms. His writings at Leicester embraced various tracts printed for private circulation; a number of contributions to the *Eclectic Review*, among which may be mentioned his articles on *Foster's Essays* and on *Zeal without Innovation*. He died February 21, 1831.

HALLA. See HALA.

HALLAM, HENRY, the celebrated English historian, was born at Windsor in the year 1777,—some authorities make the date one year later,—and died at Pickhurst, Kent county, on January 21, 1859. Notwithstanding his great fame and recent death very little seems to be known of the personal history of Hallam. He was the son of a dean of Bristol, and was educated at Eton, and afterward went to Christ Church, Oxford, where he took his degree in 1799. He was called to the bar by the Inner Temple, and afterward became a bencher of that society, but he does not appear to have at any time attempted to obtain practice. Early in life he devoted himself to literary work, and became connected with the brilliant band of authors and politicians who then led the Whig party. He took no active part in practical politics, and was in fact unsuited by nature for the rough work of party polemics. But he was an active supporter of many popular movements—particularly of that which ended in the abolition of the slave trade; and he was throughout his entire life sincerely and profoundly attached to the political principles of the Whigs, both in their popular and in their aristocratic aspect. Hallam's earliest literary work was undertaken in connection with the great organ of the Whig party, the *Edinburgh Review*, where his review of Scott's *Dryden* attracted much notice. His first great work, *The View of the State of Europe during the Middle Ages*, was produced in 1818, and was followed nine years later by the *Constitutional History of England*. In 1838–39 appeared the *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries*. These are the three works on which the fame of Hallam rests. They at once took a place in English literature which has never been seriously challenged. A volume of supplemental notes to his *Middle Ages* was published in 1848. These facts and dates represent nearly all the events of Hallam's career. The strongest personal interest in his life was the affliction which befell him in the loss of his children, one after another. His eldest son, Arthur Henry Hallam,—the "A. H. H." of Tennyson's *In Memoriam*, and by the testimony of his contemporaries a man of the most brilliant promise,—died in 1833 at the age of twenty-two. Seventeen years later, his second son, Henry Fitzmaurice Hallam, was cut off like his brother at the very threshold of what might have been a great career. The premature death and high talents of these young men, and the association of one of them with the most popular poem of the age, have made Hallam's family afflictions better known than any other incidents of his life. He survived wife, daughter, and sons by many years. In 1834 Hallam published *The Remains in Prose and Verse of Arthur Henry Hallam, with a Sketch of his Life*. In 1852 a selection of *Literary Essays and Characters* from the *Literature of Europe* was published. Hallam was a fellow of the Royal

Society, and a trustee of the British Museum, and enjoyed many other appropriate distinctions. In 1830 he received the gold medal for history, founded by George III.

HALLE (formerly called, to distinguish it from other towns of the same name, Halle in Sachsen, but now generally known as Halle an der Saale), a city of Prussian Saxony, government district of Merseburg, is situated on the right bank of the Saale and at the junction of six railways, twenty miles northwest of Leipzig. It consists of the old town, or Halle proper, with five suburbs, and the two small towns of Glauchau and Neumarkt, which were added to it in 1817. Halle is under the immediate jurisdiction of the crown, and is the seat of the imperial chief office of mines for the provinces of Saxony, Brandenburg and Pomerania, of a head tax-office, of a circle court and a provincial office. Its well-known university was founded by King Frederick I. in 1694 in behalf of the jurist Thomasius, whom many students followed to Halle when he was expelled from Leipzig through the enmity of his fellow professors. It was closed by Napoleon in 1806 and again in 1813; and in 1815 it was united with that of Wittenberg. It has faculties of theology, law, medicine and philosophy. From the beginning it has been recognized as one of the principal schools of Protestant theology, and has numbered among its professors some of the most eminent names of Germany. Its maximum number of students occurred in 1829, when they exceeded 1,300. Subsequently the number declined below 600, but at present the average attendance is between 900 and 1,000. The present buildings were erected in 1834. In connection with the university there are a botanical garden, a theological and normal seminary, a medical and surgical clinical institute, a maternity hospital, an observatory, and a library of over 100,000 volumes, which also contains collections of coins and engravings. In 1859, a bronze statue was erected in the market-place to Handel, who was born at Halle in 1685; and in the outskirts of the town there is a monument to the Germans who fell at the battle of Leipzig in 1813. The salt-springs of Halle have been known from a very early period. Some rise within the town, and others on an island in the Saale; and together their annual yield of salt is about 12,000 tons. The workmen employed in connection with the manufacture are a peculiar and distinct race known by the name of *Hallorven*, probably descended from an old Frankish colony. They observe several ancient customs, and enjoy certain special exemptions and privileges. Population (1901), 156,611.

HALLECK, FITZ-GREENE, an American poet, was born at Guildford, Conn., July 8, 1790. By his mother he was descended from John Eliot, the "Apostle of the Indians." An early age he became clerk in a store at Guildford, and at eighteen he entered a banking house in New York. Having made the acquaintance of Joseph Rodman Drake in 1810, he assisted him under the signature of "Croaker junior" in contributing to the *New York Evening Post* the humorous series of "Croaker Papers." In 1821 he published his longest poem, *Fanny*, a satire on local politics and fashions in the measure of Byron's *Don Juan*. He visited Europe in 1822-1823, and after his return published anonymously in 1827 a volume of poems in which were included *Ahrwick Castle* and *Burns*. From 1824 to 1849 he was confidential agent of John Jacob Astor, who named him one of the trustees of the Astor library. In 1864 he published in the *New York Ledger* a poem of 300 lines, entitled "Young America." He died at Guildford, November 19, 1867. The poems of Halleck are written with great care and finish, and manifest the possession of a fine sense of harmony and of genial and elevated sentiments.

HALLECK, HENRY WAGER, an American general, was born at Waterville, Oneida county, N. Y., January 15, 1815. After studying a short time at Union College, he in 1835 entered the West Point military academy, whence he was in 1839 promoted to the army as second lieutenant in the corps of engineers, being at the time appointed assistant professor of engineering at the academy. In the following year he was made an assistant to the board of engineers at Washington, and from 1841 to 1844 he was employed in connection with the fortification of New York harbor. In 1845 he was sent by the government to examine the principal military establishments of Europe, and during his absence he was promoted to the rank of first lieutenant. After his return he in the winter of 1845-1846 delivered at the Lowell Institute, Boston, a course of twelve lectures on the science of war, published in 1846 under the title *Elements of Military Art and Science*, and republished with additions in 1861. On the outbreak of the Mexican war in 1846, he as military engineer, accompanied the expedition to California and the Pacific coast, where he distinguished himself not only as an engineer, but by his administrative skill as secretary of state, and by his presence of mind and bravery in several skirmishes with the enemy. In 1847 his services were recognized by promotion to the rank of captain. He continued for several years to act on the staff of General Riley in California, holding at the same time the office of secretary of state of the territory; and he took a leading part in framing the State constitution of California, on its being admitted into the union. In 1852 he was appointed inspector and engineer of lighthouses, and in 1853 he was promoted captain of engineers. In 1854 he resigned his commission to practice law, and so great was his success in his profession that the firm of which he was senior partner soon obtained one of the largest legal businesses in the State. On the outbreak of the civil war he was in August, 1861, appointed major-general of the United States army, and in the following November was appointed commander of the western department. In July of the same year he was appointed general-in-chief of the armies of the United States — a position he held till March, 1864, when he was succeeded by Grant and was appointed chief of the staff. In April, 1865, he held the command of the military division of the James, and in August of the same year of the military division of the Pacific, which he retained till March, 1869, when he was transferred to that of the South, a position he held till his death at Louisville, January 9, 1872. The military record of General Halleck, especially in relation to his conduct of the affairs of the position of commanding general, has been the subject of acrimonious discussion, *pro* and *con*, some authorities going to the length of accusing him of incapacity, injustice, and actions but little short of treason. These questions are yet, and probably always will be, open and unsettled.

HALLER, ALBRECHT VON, one of the greatest of the anatomists and physiologists of the eighteenth century, was born at Bern, Switzerland, October 16, 1708. When still hardly fifteen he was already the author of numerous metrical translations from Ovid, Horace and Virgil, as well as of original lyrics, dramas, and an epic of four thousand lines on the origin of the Swiss confederation. In his sixteenth year he entered the university of Tübingen (December, 1723), where he studied under Camerarius and Duvernoy. Dissatisfied with his progress, he, in 1725, exchanged Tübingen for Leyden, where Boerhaave was in the zenith of his fame, and where Albinus had already begun to lecture in anatomy. At that university he graduated in May, 1727, undertaking successfully in his thesis to prove that the

so-called salivary duct, claimed as a recent discovery by Coschwitz, was nothing more than a blood-vessel. Haller then visited London and Paris, where he studied under Ledran and Winslow; and in 1728 proceeded to Basel, where he devoted himself to the study of the higher mathematics under John Bernoulli. It was during his stay there also that his first great interest in botany was awakened; and, in the course of a tour through Savoy, Baden, and several of the Swiss cantons, he began a collection of plants which was afterward the basis of his great work on the flora of Switzerland. In 1729 he returned to Bern and began to practice as a physician; his best energies, however, were devoted to the botanical and anatomical researches which rapidly gave him a European reputation, and procured for him from George II., in 1736, a call to the chair of medicine, anatomy, botany, and surgery, in the newly founded university of Göttingen. The quantity of work achieved by Haller in the seventeen years during which he occupied the post was immense. Apart from the ordinary work of his classes, which entailed upon him the task of newly organizing a botanical garden, an anatomical theater and museum, an obstetrical school, and similar institutions, he carried on without interruption those original investigations in botany and physiology, the results of which are preserved in the numerous works associated with his name. Notwithstanding all this variety of absorbing interests, he never felt at home in Göttingen; his untraveled heart kept ever turning toward his native Bern (where he had been elected a member of the great council in 1745), and in 1753 he resolved to resign his chair and return to Switzerland. About 1773 the state of his health rendered necessary his entire withdrawal from public business; for some time he supported his failing strength by means of opium, on the use of which he communicated a paper to the *Proceedings* of the Göttingen Royal Society in 1776; the excessive use of the drug is believed, however, to have hastened his death, which occurred on December 17, 1777.

HALLEY, EDMUND, an eminent astronomer, was born near London, October 29, 1656. Before leaving school for Queen's College, Oxford, which he entered as commoner in 1673, he had observed the change in the variation of the compass, and, at the age of nineteen, he supplied a new and improved method of determining the elements of the planetary orbits. His detection of considerable errors in the tables then in use led him to the conclusion that a more accurate ascertainment of the places of the fixed stars was indispensable to the progress of astronomy; and, finding that Flamsteed and Hevelius had already undertaken to catalogue those visible in northern latitudes, he assumed to himself the task of making observations in the southern hemisphere, and, in November, 1676, he embarked for St. Helena. On the voyage he noticed the retardation of the pendulum in approaching the equator; and during his stay on the island he observed the transit of Mercury, which suggested to him the important idea of employing similar phenomena for the calculation of the solar distance. He returned to England in November, 1678, having by the registration of 360 stars won the title of the "Southern Tycho," and by the translation to the heavens of the "Royal Oak," earned a degree of master of arts, conferred at Oxford by the king's command, December 3, 1678, almost simultaneously with his election as fellow of the Royal Society. In Paris he observed, with Cassini, the great comet of 1680 after its perihelion passage. He now engaged chiefly upon lunar observations, with a view to the great desideratum of a method of finding the longitude at sea. His mind, however, was also busy with the momentous problem of

gravity. Having reached so far as to perceive that the central force of the solar system must decrease inversely as the square of the distance, and applied vainly to Wren and Hooke for further elucidation, he made, in August, 1684, that journey to Cambridge for the purpose of consulting Newton, which resulted in the publication of the *Principia*.

In 1696 he was, although a zealous Tory, appointed comptroller of the mint at Chester, and (August 19, 1698) he received a commission as captain of the *Paramour Pink*, for the purpose of making extensive observations on the conditions of terrestrial magnetism. This task he accomplished in a voyage which lasted two years, and extended to the 52d degree of S. latitude. The results were published in a *General Chart of the Variations of the Compass* in 1701; and immediately afterward he executed, by royal command, a careful survey of the tides and coasts of the British channel, an elaborate map of which he produced in 1702. On his return from a journey to Dalmatia, for the purpose of selecting and fortifying the port of Trieste, he was nominated, November, 1703, Savilian professor of geometry at Oxford, and received an honorary degree of doctor of laws.

Between 1713 and 1721 he acted as secretary to the Royal Society, having previously during eight years (1685-93) filled the same office, and early in 1720 he succeeded Flamsteed as astronomer-royal. Although in his sixty-fourth year, he undertook to observe the moon through an entire revolution of her nodes (eighteen years), and actually carried out his purpose. He died in the full possession of his faculties, January 14, 1742, at the age of eighty-five.

HALLOWEVEN or HALLOWE'EN, the vigil of Hallowmas or All Saints' Day. For some account of the singular observances by which it used to be, and to some extent still is, distinguished in Scotland and elsewhere, reference may be made to such works as Brand's *Popular Antiquities*, Chambers' *Book of Days*, or better still to the well-known poem of Burns. Though sometimes neglected in modern practice, the most essential part of Hallowe'en ritual seems to consist in the lighting by each household of a bonfire at nightfall. This points to the very ancient and widely diffused practice of kindling sacred fires at certain seasons of the year. While the Germanic nations had their Osterfeuer and Johannisfeuer, the Celtic had their Bealtine or Beltine (see BELTANE) and Samhtheine, the former on the eve of May 1, and the latter on the eve of November 1. Probably the winter as well the summer festival was from the beginning regarded as a season at which the fairies were both unusually active and unusually propitious; but there is no evidence to show that the methods of divination at present usually resorted to, although of great antiquity, were originally regarded as limited in their efficacy to any one day.

HALLUIN, a town of France, in the department of Nord and arrondissement of Lille, is situated near the right bank of the Lys. Population about 11,000.

HALMSTAD, the chief town of the Swedish län Halland or Halmstad, is situated on the east shore of the Cattagat, about seventy-six miles south-southeast of Gothenburg, and the mouth of the river Nissa. The castle is the residence of the governor of the province. Population (1900), 15,362.

HALO, a luminous circle of light surrounding one of the heavenly bodies. A better definition perhaps would be "a ring of colored light formed by refraction, on the passage of light from one of the heavenly bodies through the aqueous vapor surrounding the earth." This would include coronæ and rainbows, and similar phenomena.

Halos may be divided into the following classes. They are usually seen surrounding the sun or the moon, but in the tropics small halos were observed by Humboldt round the planet Venus:

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| 1. Encircling..... | { A. Simple. |
| | { B. Compound, <i>i.e.</i> , halo systems. |
| | { C. Coronæ. |
| 2. Opposite. | { α . Rainbows. |
| | { β . Fog-bows and mist halos. |
| | { γ . Mountain specters. |

Halos of the classes A and B are generally attributed to refraction and reflection of the rays of light by the presence of minute snow crystals in the upper strata of the air, and they occur usually when cirrus or cirro-stratus clouds exist. This theory was originated by Descartes, and was adopted by Marriotte (in 1686), and subsequently followed by Doctor Young and Sir Isaac Newton. It is, however, probable that some halos and certainly all coronæ (class C) are formed by refraction of light from globules of water suspended in the atmosphere. Simple halos are either about twenty-two and one-half degrees or forty-seven degrees in diameter. The ice or snow crystals, being hexagonal in form, sometimes produce a double refraction, and then the large and small halos are seen at the same time, and, reflexion taking place from the surfaces of the crystals, additional halos or parts of halos are formed.

At the points of intersection of the halos, images of the sun or moon sometimes appear; when seen with the former, they are called *parhelia* or *mock-suns*, and when with the latter, *paraselenæ* or *mock-moons*. They are sometimes accompanied with flaming tails, and are usually of prismatic colors, as also are the halos and coronæ. The latter are seen when fleecy clouds or mist intervene between the spectator and the sun or moon, to which they are in immediate proximity, thereby being distinguished from the halos, which are formed at a distance from those luminaries. The predominating color in coronæ is red or orange.

The second principal division of halos includes those which are seen opposite to the sun and moon. The first class of these comprises rainbows, which are occasioned by refraction of the light from the sun or moon, produced by falling rain, causing a bow with the prismatic colors in concentric bands and arranged as they appear in the solar spectrum. When the rain is abundant an inner bow is formed, the colors in which are in inverted order. Rainbows, when seen from mountain tops and the topmasts of ships, are completely circular. Fog-bows and mist halos are somewhat similar. Mist halos are seen in the vapor of fountains or waterfalls, and resemble rainbows. Mountain specters are caused by reflexion, and often appear accompanied by chromatic halos. They generally occur on mountains when the sky between the observer and the sun is clear and there is a mist or cloud on the side of the mountain opposite to the sun, on which the summit of the mountain and the buildings and persons standing near are reflected. The most notable of mountain specters is that of the Brocken, in the Harz mountains.

Many of the ancient descriptions of miraculous appearances in the heavens may be attributed to the phenomena before mentioned. Among the chief of these is the appearance of a cross which the emperor Constantine alleged he saw in the heavens about noon when marching against Maxentius (about 313 A.D.), and which was the cause of his conversion to christianity. Some writers have doubted the occurrence; but it is quite possible Constantine saw part of a system of solar halos, and two of these at right angles would form a cross.

HALS, FRANS, was born at Antwerp according to most authorities in 1584, and died at Haarlem in 1666.

As a portrait painter second only to Rembrandt, he displayed extraordinary talent and quickness in the exercise of his art coupled with improvidence in the use of the means which that art secured to him.

HALSTEAD, a market-town of England, county of Essex, is situated on the Colne Valley Railroad and on a steep acclivity rising from the river Colne, forty-eight miles northeast of London. Population, 7,000.

HALYBURTON, THOMAS, a distinguished Scottish divine, was born at Duppelin, near Perth, December, 1674; and died in 1712.

HAM (חַם), of whose position in order of birth there has been much dispute, is usually spoken of as the second son of Noah, and the progenitor of Cush, Mizraim, Phut, and Canaan. On the assumption that these early genealogies are geographical rather than personal or even ethnological, the name Ham, which in Hebrew radically signifies "hot," would seem to indicate the torrid zone; and this inference, though not supported, so far as has been hitherto discovered, by any corresponding explanation of the names of Shem and Japheth, at least harmonizes well with the fact that on the whole Shem seems intended to denote the intermediate and Japheth the northern regions of the world as known to the compiler of the book of Genesis.

HAM, a small town of France, in a marshy district on the left bank of the Somme, about forty miles southeast of Amiens, on the railway between Amiens and Rheims. It had in 1896 a population of only 3,622; but historically it is a place of very considerable importance. From the ninth century onward it appears as the seat of a lordship which, after the extinction of its hereditary line, passed in succession to the houses of Coucy, Enghein, Luxembourg, Rohan, Vendôme, and Navarre, and was finally united to the French crown on the accession of Henry IV. The castle, founded by Odo in the twelfth century, was rebuilt in the thirteenth and extended in the fourteenth, and its present appearance is mainly due to Louis of Luxembourg, count of St. Pol, who between 1436 and 1470 not only furnished it with outworks, but gave such a thickness to the towers and curtains, and more especially to the great tower or donjon which still bears his motto *Mon Myeux*, that they would offer a long resistance even to modern artillery. It forms a rectangle 395 feet long by 263 feet broad, with a round tower at each angle and two square towers protecting the curtains. The eastern and western sides are each defended by a demi-lune. The Constable's Tower, for so the great tower is usually called in memory of St. Pol, has a height of about 100 feet, and the thickness of the walls is thirty-six feet; the interior is occupied by three large hexagonal chambers in as many stories. As the castle of Ham has frequently been used as a state prison both in ancient and modern times, the list of those who have tasted its hospitality is an interesting one, including Joan of Arc, Louis of Bourbon, the ministers of Charles X., Louis Napoleon, Cavaignac, and Lamoricière. Louis Napoleon was there for six years, and at last effected his escape in the disguise of a workman. During 1870-71 Ham was several times captured and recaptured by the belligerents.

HAMADAN, a town of Persia, in the province of Irak-Adjemi, 162 miles west-southwest of Teheran, in the district of the Djebal at the foot of the Elvend or Arwand Mountain, the Orontes of the ancients. It is a busy place of about 50,000 inhabitants, and has large and well-stocked bazaars.

HAMAH, the Hamath of the Bible, one of the oldest cities of Syria, situated in the valley of the Orontes, 10 English miles north of Damascus. It finds a place

among the northern boundaries of the Holy Land and is frequently mentioned in Old Testament history.

HAMANN, JOHANN GEORG, a distinguished writer on philosophical and theological subjects, was born at Königsberg, Prussia, in 1730, and died in 1788.

HAMĀSAH (more correctly HAMĀSEH), the name of a famous Arabian anthology compiled by Habib ibn Aws et-Tāi, surnamed Abū Temmām, (corruptly ABUTEMAN, *q.v.*) The collection is so-called from the title of its first book. It consists of ten books or parts, containing in all 884 poems or fragments of poems.

HAMBAGO, a form of the name AMBATO, (*q.v.*)

HAMBURG, a state of the German empire, which consists of the city of Hamburg with its incorporated suburbs of St. George's and St. Paul's, the surrounding district with the sixteen suburban hamlets (*Vororte*), several islands in the Elbe, the five enclaves of Volksdorf, Hansdorf, etc., in Holstein, the communes of Moorburg in Lüneburg and Cuxhaven-Ritzbüttel, in the northwest of the duchy of Bremen at the mouth of the Elbe, the island of Neuwerk about five miles from the coast, and the bailiwick (*amt*) of Bergedorf, which up to 1867 was held in common by Lübeck and Hamburg. The whole territory has an area of 157.18 square miles, exclusive of ninety-nine square miles occupied by the Elbe. Of this area one hundred and twenty-four square miles are within the limits of the German customs, but the rest continues to be practically "abroad" in relation to the commerce of the empire. In 1901 the total population of the State was 768,349.

HAMBURG, one of the most remarkable cities of Germany, and indeed of Europe, ranking as it does as the first of all the seats of commerce on the continent, is situated, on the right bank of the northern arm of the Elbe, about ninety-three miles from the mouth of that river, just where it is joined by the Alster and the Bille. Were it not for political and municipal boundaries Hamburg might be considered as forming one town with Altona and Ottensen, the three presenting to the river a continuous frontage of nearly four miles; and long lines of suburbs radiate inland in various directions. The city proper lies on both sides of the Alster, which, having been dammed up a short distance from its mouth, now forms a considerable lake, of which the southern portion within the line of the fortifications bears the name of the Inner Alster, and the other and larger portion (2,300 meters long and 1,200 meters wide at the widest) that of the Outer Alster. The fortifications as such were removed in 1815. The oldest portion of the city is that which lies to the east of the Alster; but, though it still retains the name of Altstadt, nearly all trace of its antiquity has disappeared, as it was rebuilt after the great fire of 1842. To the west lies the new town, incorporated in 1678; beyond this and contiguous to Altona is the quondam suburb of St. Paul's, incorporated in 1876, and toward the northeast is the quondam suburb of St. George, which arose in the thirteenth century, but was not incorporated till 1868. The old town lies low, and it is traversed by a great number of narrow canals or "fleets," which add considerably to the picturesqueness of the meaner quarters, and serve as convenient channels for the transport of goods. They generally form what may be called the back streets, and they are bordered by warehouses, cellars, and the lower class of dwelling-houses.

Of the churches actually existing in Hamburg (the old cathedral had to be taken down 1805), St. Peter's, St. Nicholas, St. Catharine's, St. James' and St. Michael's are those that give name to the five old city parishes. The church of St. Nicholas is remarkable more especially for its tower, which until the spire of Cologne Cathedral reaches its projected elevation of 511 feet, will

probably continue to be the second highest cathedral in the world, rising as it does to a height of 473 feet, about nineteen feet lower than St. Ouen's at Rouen.

The oldest water-works of Hamburg were those of the Oberdamm, constructed in 1531; the first of the modern system, with steam power, was the Bieber'sche Elbwasserkunst, opened in 1822. In 1849 the city water-works belonging to the state were set in operation, and they have since incorporated and systematized the older water-works. In 1875 they had five steam engines with 850 horse power, and raised 876,000,000 cubic feet of water at a cost of about 16 cents per 1,000 cubic feet. It was not till after the fire of 1842 that Hamburg began to be properly drained; but it now possesses an extensive and elaborate system of sewers. In 1853 the upper Old Town, the New Town, and St. George's were supplied, and in 1859 the lower Old Town; and between 1871 and 1875 the system was extended to the aristocratic suburban districts of Uhlenhorst and Eimsbüttel. In 1875 the total length of sewers was 512,226 feet, which had cost £662,850. The largest sewers, of which there were 10,499 feet, have a diameter of nearly ten feet, and can be traversed by boats; the second class (8,330 feet) have a diameter of seven feet, and the third class (19,853 feet) of five and three-fifths feet.

The harbor of Hamburg, as it now exists, is a very modern creation. At first the city was at some distance from the main branch of the Elbe, and the mouth of the Alster served as its port, but partly owing to natural changes in the bed of the great river, and more to the vast engineering enterprises of the inhabitants,—such as the cutting of the channels through the Grandeswerder (1550), the Spadenland marshes (1570), and the Brook,—the principal current was divided into its present course.

Hamburg is emphatically a commercial city, and though within recent years greatly developed, its manufacturing industries are in comparison unimportant; but only in comparison, for, according to the official return of 1895, no fewer than 265,441 persons were engaged in metallurgy, in the manufacture of machinery, instruments, and tools, and 940 in chemical works; 250,844 in commerce and trade; 1,464 in textile industries; 50,008 in the professions; 21,807 in domestic service; and 22,592 in agriculture and cattle rearing. Shipbuilding is carried on extensively.

In the extent of its commerce Hamburg ranks among European ports immediately after London, Liverpool and Glasgow. Its imports and exports are more than those of the whole of Holland, of Belgium, or of Spain. The principal line of steamers is that of the Hamburg American Company. Its voyages are mainly made to New York and the West Indies.

The monetary transactions of Hamburg have long been maintained on a very extensive scale. As early as 1619 the great Hamburg giro-bank was founded on the model of that of Amsterdam, and, in spite of the blow struck by the French in 1813, it continued to flourish till in 1876 it was replaced by a chief office of the German Imperial Bank, which includes in its domain the province of Schleswig-Holstein-Lauenburg, the three Hanseatic towns, and the two grand-duchies of Mecklenburg. The population in 1890 was 350,000, and is now (1902) 705,738.

The death rate varied from twenty-six to thirty per thousand per annum. Consumption and acute diseases of the respiratory organs are the most prevalent causes of death.

Hamburg, or, as the older documents have it, Hamaburg, appears to have taken its rise as a frontier block-house or castle on the Slavonic borders of Ger-

many, which in the nineteenth century lay thus far to the west. All through the tenth century Hamburg continued to suffer from the inroads of the Danes and the Slavonians, and the latter indeed were in possession from 983 to 987. The alliance with Lübeck, commenced in 1241, and consummated by the treaty of 1255, practically laid the basis of the great Hanseatic League, of which Hamburg continued to be one of the principal members. While its foreign relations were thus improved, its internal organization was also rendered more stable by the new constitution of 1270, and the recognition of the municipal autonomy of the counts of Schauenburg in 1292. The claims of the Danish crown to the homage of the city were rejected, and the imperial diet of 1510 under Maximilian I. declared that it was the city of the empire. Not long after two great changes took place. By the so-called "Long Recess" of 1529 the Reformation was introduced, and disagreements with Lübeck set the city free to follow her own path of progress. Through the troubles of the Thirty Years' War Hamburg escaped almost unscathed; but it suffered from the effects of its own bigoted Lutheranism, which drove many of its dissentient religionists forth to become the founders of the neighboring Altona. The course of the seventeenth century was marked by discord and strife between the senate and the lower classes, which ultimately brought about the interference of the empire and the publication of the *Great Recess* of 1712. Though the courts of the empire had decided in 1618 against the claims of the Danish crown, and had confirmed this decision in 1630 and 1643, Christian V. of Denmark made another attempt to take Hamburg by force of arms; but he accepted a ransom of 280,000 rixdollars, and at length in 1768 by the treaty of Gottorp the Danish crown renounced all its claims, and in 1770 the delegates of the city took their places in the "Rhenish bench" of the imperial diet. From the Seven Years' War and the war of American independence the commerce of Hamburg drew new life, but it suffered terribly during the years of the French ascendancy. The town was not only obliged in 1803 to pay 2,125,000 francs, to the Hanoverian estates, but in 1806 it had to admit a French garrison within its walls, and to feel the effects of the British blockade of the Elbe. In 1810 indeed it had the honor of being incorporated in the French empire as the chief town of the department of the "Mouths of the Elbe;" but the retreat of the French commandant Carra Saint Cyr on March 12, 1813, and the subsequent entrance of the Russian Tenterborn on the 18th, were welcomed by the citizens with joy. But their joy was premature, for by May 30th the enemy was again in possession. Davoust, the new general, not only demanded a contribution of 48,000,000 francs, but confiscated the 7,506,956 marks banco (of about 1s. 6d.) at that time in the bank, forced the inhabitants to work at the new fortifications, and drove 20,000 or 30,000 of them out of the city amid the cold of winter. In spite of the attacks of the Russians under Benningsen, Davoust maintained his position till the close of the war. The whole loss of the city from 1806 to 1814 is estimated at £10,500,000 sterling. In 1815 Hamburg became an independent state of the German federation, and formed, with Lübeck, Bremen, and Frankfort, the curia of the free cities. Its trade rapidly revived, and when in 1842 the great fire destroyed 4,219 buildings and rendered nearly 20,000 persons homeless, its credit was sufficient to secure a loan of thirty-four million marks banco. The old oligarchical constitution had been restored after the recovery of independence; and the internal history of the town from 1840 till 1860 is mainly a protracted contest between the conservative and innovative parties. The year 1858 was remarkable

for a great commercial crisis, and for the meeting in the town of the commission of the navigation of the Elbe, and of the delegates appointed by the principal German states to consider maritime law. By the new constitution of 1861 industrial freedom was introduced, possession of land permitted to strangers, the conditions of settlement greatly modified, and various improvements made in the taxation and duties. At the outbreak of the contest between Prussia and Austria in 1866, Hamburg sided with the former, and in May, 1867, it voted for the constitution of the North German Confederation.

On October 1, 1888, Hamburg entered the German Custom Union, though still retaining part of its territory as a "free port." This change has necessitated extensive alterations in the harbor; several quays have been built, warehouses constructed, steam-cranes erected, and the railway communication with the chief industrial centres of Germany improved.

HAMELN, the chief town of a circle in the province of Hanover, Prussia, is situated at the confluence of the Weser and Hamel, and at the junction of four railways, twenty-five miles southwest of Hanover. Population about 12,000.

Hamel is famed as the scene of the myth of the piper of Hameln. According to the legend, the town in the year 1284 was so infested by rats as almost to compel the inhabitants to leave it, when one day there appeared upon the scene a piper, clad in a fantastic suit, who offered, for a certain sum of money, to charm all the vermin into the Weser by his piping. His conditions were agreed to, but after he had fulfilled his promise, the inhabitants, on the ground that he was a sorcerer, declined to fulfill their part of the bargain, whereupon, on June 26, he reappeared on the streets of the town, and putting his pipe to his lips began a soft and curious strain, which drew all the children to come trooping after him, while he led them out of the town to the Koppelberg hill, in whose side a door suddenly opened, by which he entered and the children after him, all but one, who was lame, and could not follow fast enough to reach the door before it shut again, and remained fast.

HAMI, the Chinese name of a town in Central Asia, otherwise called KAMIL, KOMUL, or KAMUL, situated on the southern slopes of the Tian-Shan mountains, and on the northern verge of the Great Gobi desert.

HAMILCAR BARCA, the most illustrious of all the Carthaginian generals and statesmen, next to his son, the great Hannibal. The surname Barca is the same as the Hebrew *Barak*, and signifies "lightning." It was in the eighteenth year of the First Punic War, 247 B.C., that Hamilcar first greatly distinguished himself. He had been known before as a young officer of promise who had made raids on the southern coasts of Italy in the neighborhood of Locri and Cumæ. Suddenly he appeared with a squadron off the northwest of Sicily, and seized a strong position on Mount Ercte, now known as Mount Pellegrino, near Palermo. He had but a small force of mercenaries, which his military genius soon made into a well-disciplined body of troops. For three years he maintained himself on Mount Ercte, during which time the Romans were in possession of the whole of Sicily with the exception of the two strongholds of Drepanum and Lilybæum, and these they were blockading. The Romans, feeling it necessary to make a supreme effort, in 242 B.C. equipped a fleet, under the command of the consul Lutatius Catulus, and dispatched it to the western shores of Sicily. The battle off the Ægates followed, and the Roman victory decided the First Punic War in 241 B.C.

No sooner had peace been concluded than there broke out the so-called African or Libyan War. It

was a most formidable mutiny or insurrection. The peace party at Carthage, headed by Hanno, who hated Hamilcar, was foolish enough to raise a dispute about the pay of the troops. The result was a furious mutiny, which Hanno, who was sent to quiet them, could not appease. The men to the number of 20,000 began to march on Carthage itself, and encamped near Tunis. But they were soon surrounded and cut off to a man. The war, which had lasted three years and four months, was over in the year 238 B.C.

Hamilcar was made commander-in-chief of the Carthaginian army in Africa, and invested with a power which could be taken from him only by the popular assembly. He was still a young man, under thirty years of age. For a short time he employed himself in overawing the Numidian tribes bordering on Carthaginian territory, but his main object was to form the nucleus of an efficient army out of his Libyan mercenaries. Meanwhile he was maturing a great plan which soon afterward on his own responsibility he carried into execution. Spain was a country the coasts of which at least were well known to the Carthaginians. Spaniards too had served among Hamilcar's troops. To Spain he decided to go; there, he felt sure, he could find material for an army and abundant means of providing pay. He had now three sons, the "lion's brood," as he called them, Hannibal, Hasdrubal, Mago. Wishing with all his heart that they should be like minded with himself, he made the eldest, Hannibal, then a boy of nine, swear on the altar of the supreme Carthaginian deity eternal hatred and enmity to Rome. This was just before he left Carthage, probably in the spring of 236 B.C. He never returned. The last eight years of his life he devoted to the great work of reducing Spain to a Carthaginian province. Had his life been prolonged, he would doubtless, as Livy says, have invaded Italy at the head of a Carthaginian army. What he accomplished in Spain so much impressed the elder Cato, who less than half a century afterward saw the traces of his work, that he declared that there was no king like Hamilcar Barca. In the prime of his years he fell in battle in 228 B.C., fighting, it would seem, somewhere between the Tagus and the Douro. Spain was now left in the hands of his son-in-law Hasdrubal.

HAMILTON, a municipal and parliamentary borough and market-town of Scotland, county of Lanark. Among the industries of the town are weaving and the tanning of muslin; and there are also large market gardens; but the prosperity of the town depends chiefly upon the coal and iron-stone which are extensively worked in the neighborhood. Hamilton originated in the fifteenth century under the protecting influence of the lords of Hamilton. It unites with Airdrie, Falkirk, Lanark, and Linlithgow to form the Falkirk district of boroughs, which returns one member to parliament. Population, 13,000.

HAMILTON, a Canadian city, in the county of Wentworth, Province of Ontario, lies at the western end of Lake Ontario, about seventy-five miles northwest from Buffalo, N. Y. Its site is the footlands of the base of a series of hills, the name "mountain" being appended to the elevation contiguous to the city. The first settlement in the city was made in 1778 by a Pennsylvania Tory named Robert Land, who emigrated from Pennsylvania on account of the hostilities then in progress between England and the colonies. Soon afterward he was joined by his wife and two sons and commenced farming on a tract of land which is now in the heart of the city. From this time till 1813 the little community grew slowly. In that year George Hamilton, a far-seeing member of the parliament, laid out the town site which has since been the nucleus around

which the present city has grown. During the war of 1812 Hamilton was regarded as a strategic point of value by both the Americans and the Canadians, and there still are to be seen traces of the old earthworks by which the city was fortified. The battle of Stony Creek, however, prevented the city from actually being the scene of conflict, as the Federal troops were routed here and the invasion was practically ended. From 1814, at which time the first general merchandise store was established in the town, the growth of the place was more perceptible, and when in 1824 the Hamilton canal was chartered (finished eight years later) a rapid growth was immediately resultant. By its great natural advantages, and its convenience of situation for commercial traffic by way of the great lakes, a large number of immigrants were attracted, and the town was soon in the enjoyment of what we in this day call a "boom." By 1858 the population had reached the number of nearly 22,000. Ten years before it was only 7,000. This remarkable increase of population was in part due to the construction of various works, and the prosecution of private corporate enterprises, the most notable among which were the Hamilton waterworks and the Great Western and Hamilton & Port Dover railways. The town had some severe set-backs, however, in the form of fire, epidemic cholera, and last, but not least, the financial crisis of 1859, the effect of which was so disastrous that it is said for several years every energy of the people was paralyzed—not a building being erected in all that time. The present city of Hamilton is a very pretty place, the streets being mostly regular and well laid out at right angles. The buildings are handsome, and the people are supplied with all the most approved modern conveniences of urban life. The water supply is obtained from Lake Ontario, the average daily consumption last year (1889) being nearly three and one half million gallons. The amount of capital invested in manufactures is about \$10,000,000, employing 12,290 persons, paying wages yearly of \$3,800,000, and producing articles worth \$16,000,000 from raw material worth \$10,000,000. The principal manufactures are iron, machinery, agricultural implements, wooden and glassware, musical instruments, woolen and cotton goods, boots and shoes, soap, candles, etc. The shipping interests are principally represented by coal and lumber, but of late years the lumber trade has decreased.

The police department of the city government is well conducted by an efficient force of fifty men. The public schools of the city are composed of 143 rooms (or schools) with 139 teachers and 6,375 pupils. The fire department consists of thirty-four men, one steamer, one chemical engine, three hose companies, two hook and ladder companies, and one Merriweather fire escape. All the appliances and machinery of the department are of the most approved and modern style, and the discipline and efficiency of the department are very high. The religious portion of the community is well provided with churches, the principal denominations being all represented, having churches with ample sittings and vigorous organizations. There are several military volunteer organizations in the city, all in a high state of efficiency and supplied with the best modern equipment. The board of trade is an active, enterprising feature of the community and the reports of business for the year 1889 gives ample assurance of the solid prosperity of the city. Hamilton is the seat of the Anglican bishop of western Ontario and of the Catholic bishop of Hamilton. There are numerous parks and places of resort in the city and the contiguous country, and in the summers the number of pleasure-seekers at various points of interest is always large. The population of the city in 1901 was 52,634.

HAMILTON, a township and post village of Madison county, N. Y. The village is the seat of Madison university, chartered in 1846, in connection with which there are a theological seminary of the Baptist denomination opened in 1820, and a preparatory academy opened in 1832 under the name of Colgate Academy, and chartered in 1853 as the grammar school of the university. The university has ten professors, has both a scientific and a classical course, and is attended by upward of 100 students. The other educational institutions are a female seminary and a union grade school. Population (1900), 1,627.

HAMILTON, a city of Ohio, the county seat of Butler county, is a place of (1900 census) 23,914 inhabitants. It lies on the Miami river about twenty-five miles north of Cincinnati. The city has important manufactories, consisting of flouring mills, iron foundries, agricultural implement factories, breweries, etc. It has banking, railroad and telegraph facilities, together with ample educational and church accommodations. The city has had a steady growth, both in population and commercial importance.

HAMILTON, the principal town in the western district of Victoria, Australia, is situated on the Grange Burne Creek. It was proclaimed a borough in 1859, the area of the municipality being 5,280 acres. Population, 12,000.

HAMILTON, ALEXANDER, born in the Island of Nevis, West Indies, January 11, 1757; died in New York city July 12, 1804. He was the son of a Scotch merchant, and at an early age entered a business office in Saint Croix. In 1772 he came to America and studied at King's (now Columbia) college in New York city. When only seventeen years old he made a public speech in favor of the assertion of liberty by the colonists, and published several pamphlets which attracted much attention. Early in 1776 he became captain of an artillery company, which distinguished itself in the battles of Long Island and White Plains. The military talents and literary ability of young Hamilton attracted the attention of General Washington, who, in March, 1777, appointed him aide-de-camp with the rank of lieutenant-colonel. He fought at Monmouth and succeeded in persuading General Gates to furnish reinforcements to Washington after the surrender of Burgoyne. In 1781 he resigned from the staff in consequence of a disagreement with Washington, but retained his army rank and distinguished himself at Yorktown. On December 14, 1780, he married Elizabeth Schuyler, a member of a wealthy New York family. He studied law and became receiver of taxes in New York, and in November, 1782, took his seat as a member of the Continental congress, having been elected by the legislature of New York. He resigned the following year, and began the practice of law in New York city, where he speedily rose to the first rank in his profession. His fine personal appearance, magnificent voice, and suave manner, combined with his thorough study of law made him preëminent in the courts. In 1786 he was elected to the State legislature.

But Hamilton's greatest work was to come. The government of the Confederation had shown its impotence and inadequacy, and the country was suffering from the evils of a prostrate trade and a bankrupt treasury. It was evident that a permanent union of the States must be effected, and in the movement for this end Hamilton was the principal actor. He was elected to the Philadelphia convention of 1787, at which the constitution of the United States was adopted. In this body he was in a hopeless minority, but he presented his views in an able speech, and, although he withdrew

from the convention temporarily, he affixed his name to the constitution, and advocated its adoption. Hamilton was a Federalist of the extreme type. He had also inherited or acquired ideas as to the system of government, based on the ancient and aristocratic methods. The plan he proposed contemplated the election of a president and senators for life, and the nomination of State governors by the national executive. But when outvoted he accepted the results of the convention's deliberations, and in a series of powerful articles in the famous *Federalist*, recommended the ratification of the constitution. In the New York ratifying convention, Hamilton, by his eloquence and parliamentary skill, succeeded in converting the hostile majority, and at the popular election the Federalists triumphed.

Washington was inaugurated first president of the United States in April, 1789, and in September called Hamilton to the head of the newly-organized treasury department. The finances of the country were in a deplorable condition. The nation was burdened with a heavy debt, and its credit abroad was of the worst. But in a masterly document, one of the most statesmanlike papers ever prepared, Hamilton, in January, 1790, presented to congress a "Report on the Public Credit," containing a plan of financial policy by the adoption of which order was brought out of chaos. He provided for a system of funding the debt and for raising funds by taxation, by which credit was restored and the business world relieved. He favored a protective tariff for the encouragement of home manufactures, and prepared plans for a mint, for the regulation of the currency, for an excise, for the management of the post office and the public lands, and for the gradual extinction of the national debt.

The Republican party, of which Jefferson and Burr were the most prominent exponents, fought Hamilton's policy in congress and the newspapers. Hamilton advocated a strict neutrality in foreign affairs and declined to give any assistance to France, then struggling for life against the allied despotism of Europe. Jefferson, having failed to obtain the retirement of Hamilton from the cabinet, resigned himself in January, 1794. A year later Hamilton returned to his law practice, and declined the position of chief justice of the United States Supreme Court. In 1796 he supported John Adams for the presidency, and was appointed inspector-general of the army, which post he held for two years, with the rank of major-general. On Washington's death in December, 1799, he became commander-in-chief of the army, but this was shortly after disbanded, and he again returned to his law practice. Meantime the differences between Adams and Hamilton had widened and the election of 1800 was at hand. Hamilton made a bitter personal attack on Adams over his negotiations with France, and the Federalists were beaten at the polls. But Burr and Jefferson had each received an equal number of electoral votes and the choice of president devolved on the House of Representatives. The influence of Hamilton was given to Jefferson and the latter was elected. Burr neither forgot nor forgave this, nor his defeat later for the governorship of New York, in which Hamilton openly opposed him. An excuse was found for a quarrel in the language publicly used by Hamilton with reference to Burr, and the latter sent him a challenge. They met at Weehawken, on the banks of the Hudson, on the morning of July 11, 1804, and Hamilton fell mortally wounded at the first fire, dying on the following day. Burr absconded to South Carolina, not daring to face the storm of popular indignation which arose, but soon appeared in Washington and resumed his functions as vice-president. The duel was forced upon Hamilton,

and although Burr was indicted for murder, the prosecution came to nought, and he was never punished.

HAMILTON, ANTHONY or ANTOINE (1646-1720), a French classical author, who is especially noteworthy from the fact that, though by birth he was a foreigner, his literary characteristics are more decidedly French than those of many of the most indubitable Frenchmen. It is mainly, as has already been indicated, by the *Mémoires du Comte de Grammont* that Hamilton takes rank with the most classical writers of France. The work was first published anonymously in 1713 under the rubric of Cologne, but it was really printed in Holland, at that time the great patroness of all questionable authors. An English translation by Boyer appeared in 1714. Upward of thirty editions have since appeared.

HAMILTON, ELIZABETH, novelist and miscellaneous writer, was born at Belfast, of Scotch extraction, July 25, 1758. In her fifteenth year she made a tour in the Highlands with some friends, and wrote a journal which was inserted in a provincial magazine. She produced her *Letters of a Hindoo Rajah* in 1796, and in 1800 the *Memoirs of Modern Philosophers*, a satire on the admirers of the French revolution. In 1801-2 the *Letters on Education* appeared, her most valuable though not her most popular work. She died in July, 1816.

HAMILTON, JAMES (1769-1831), the author of the Hamiltonian system of teaching languages, was born in 1769 and died October 31, 1831. Having settled in Hamburg and become free of the city, he was anxious to become acquainted with German and accepted the tuition of a French emigré, General D'Angelis. In twelve lessons he found himself able to read an easy German book, his master having discarded the use of a grammar and translated to him short stories word for word into French. He came in 1814 to America, intending to become a farmer and manufacturer of potash; but, changing his plan he started as a teacher in New York. Adopting his old tutor's method, he attained remarkable success in New York, Baltimore, Washington, Boston, Montreal, and Quebec. Returning to England in July, 1823, he was equally fortunate in Manchester and elsewhere. His system attracted general attention, and was vigorously attacked and defended.

HAMILTON, PATRICK, son of Sir Patrick Hamilton, well known in Scottish chivalry, and of Catherine Stewart, daughter of Alexander, duke of Albany, second son of James II. of Scotland, was born in the diocese of Glasgow. Of his early boyhood and education nothing is known. In 1517 he was appointed titular abbot of Ferne, Ross-shire; and probably about the same year went to study at Paris. Returning to Scotland, the young scholar naturally selected St. Andrews, the capital of the church and of learning, as his residence. On June 9, 1523, he became a member of the university of St. Andrews, and was admitted to its faculty of arts. There Hamilton attained such influence that he was permitted to conduct in the cathedral a musical mass of his own composition. But the reformed doctrines had now obtained a firm hold on the young abbot, and he was eager to communicate them to his fellow-countrymen. Early in 1527 the archbishop Beaton's attention was directed to the heretical preaching of the young priest, whereupon he ordered that Hamilton should be formally summoned and accused. Hamilton fled to Germany, first visiting Luther at Wittenberg, and afterward enrolling himself as a student, under Francis Lambert of Avignon, in the new university of Marburg, opened May 30, 1527, by Philip, landgrave of Hesse. Late in the autumn of 1527 Hamilton returned to Scotland. He went first to his brother's house at Kincavel, near

Linlithgow, in which town he preached frequently. Beaton, avoiding open violence through fear of Hamilton's high connections, invited him to a conference at St. Andrews. The reformer accepted the invitation, and for nearly a month was permitted to preach freely. At length, however, he was summoned before a council of bishops and clergy presided over by the archbishop; and though he clearly and calmly answered all the written charges brought against him, his replies gave ground for new accusations of heresy. The council eagerly convicted him, and handed him over to the secular power. The sentence was carried out on the same day (February 29, 1528) lest he should be rescued by his friends, and he was burned at the stake as a heretic.

HAMILTON, ROBERT (1743-1829), an able writer on political economy and finance, was born at Pilrig, Edinburgh. In 1779 he was presented to the chair of natural philosophy at Aberdeen university. For many years, however, by private arrangement with his colleague Professor Copland, Hamilton taught the class of mathematics. In 1817 he was presented to the latter chair. For some years before his death in July, 1829, he had retired from the active business of his chair.

Hamilton's most important work is the *Essay on the National Debt*, which appeared in 1813, and was undoubtedly the first to expose the economic fallacies involved in Pitt's policy of a sinking fund.

HAMILTON, THOMAS, author of *Cyril Thornton*, was the younger brother of Professor Sir William Hamilton, Bart., and was born in 1789. He was a frequent contributor to *Blackwood's Magazine* from its commencement, his papers manifesting great variety and versatility of talent, and embracing both prose and poetry. The most popular of his contributions to that periodical was the military novel *Cyril Thornton*. He died at Pisa, 1842.

HAMILTON, SIR WILLIAM, BART., one of the most eminent of Scottish metaphysicians, was born in Glasgow on March 8, 1788. William received his early education in Scotland, except during two years which he spent in a private school near London, and went in 1807, as a Snell exhibitor, to Balliol College, Oxford. There he pursued his studies zealously, though for the most part independently,—devoting himself chiefly to Aristotle, but in other directions also laying the foundations of that wide and profound scholarship with which his name is associated. In November, 1810, he took the degree of B.A. with first-class honors, after an examination so much above the usual standard in the number and difficulty of the works which it embraced that the memory of it was long preserved at Oxford. He had been intended for the medical profession, but, soon after leaving Oxford, gave up this idea, and in 1813 became a member of the Scottish bar. Henceforward Edinburgh was his place of residence, and, except on occasion of two short visits to Germany in 1817 and 1821, he never again quitted Scotland. His life was mainly that of a student; and the following years, marked by little outward incident, were filled by researches of all kinds, through which he daily added to his stores of learning, while at the same time he was gradually forming his philosophic system.

In 1820 he was an unsuccessful candidate for the chair of moral philosophy in the university of Edinburgh. Soon afterward he was appointed professor of civil history, and as such delivered several courses of lectures on the history of modern Europe and the history of literature. In 1829 his career of authorship began with the appearance of the well known essay on the *Philosophy of the Unconditional*—the first of a series of articles contributed by him to the *Edinburgh Review*. He was elected in 1836 to the Edinburgh chair of logic and

metaphysics, and from this time dates the influence which, during the next twenty years, he exerted over the thought of the younger generation in Scotland. In 1852-53 appeared the first and second editions of his *Discussions in Philosophy, Literature and Education*, a reprint, with large additions, of his contributions to the *Edinburgh Review*. Soon after his general health began to fail. Still, however, aided now as ever by his courageous and devoted wife (he had married in 1829), he persevered in literary labor; and during 1854-55 he brought out nine volumes of a new edition of Stewart's works. The only remaining volume was to have contained a memoir of Mr. Stewart from his pen; but this he did not live to write. He taught his class for the last time in the winter of 1855-56. Shortly after the close of the session he was taken ill, and on May 6, 1856, he died at his house in Edinburgh.

HAMILTON, SIR WILLIAM (1730-1803), antiquary and patron of the fine arts, was born in 1730. Of his early life and education we know nothing beyond the fact that he was equerry to Prince George; but in his twenty-fifth year he married a young and beautiful heiress, whose fortune placed him in affluence. In the first parliament of George III. Hamilton sat as member for Midhurst; and in 1761 he was accredited ambassador to Naples, an office which he retained till 1800. On proceeding to his post his attention and interest were at once awakened by the discoveries at Pompeii and Herculaneum, and he took up the studies of antiquities with ardor. The Porcinari collection of Greek and Etruscan vases, purchased in 1765, was the nucleus of a valuable collection of his own, now for the most part in the British Museum. Hamilton also contributed liberally to the museum at Portici, and gave much attention to the MSS. and other valuable articles rescued from the buried cities; but his efforts were almost nullified by the inertness of the Neapolitan court, which was even suspicious of his zeal. Natural history and science also were not neglected by him. Hamilton's daughter died in 1775, and his first wife in 1782. In 1772 he was made K.C.B., and in 1791 privy councillor. His continued interest in art and antiquity is manifested by his contributions to the *Philosophical Transactions* of the Royal Society from 1767 to 1795, and to the *Archæologia* in 1777, as well as by his generosity to artists and antiquaries, such as Morghen, Winckelmann, and Piaggi. Recalled in 1800, he died April 6, 1803. Sir William Hamilton's second wife, Emma Lyon or Harte, whose name is so notoriously associated with that of Nelson, was born of very humble parents at Preston, in Lancashire, about April 26, 1764. Her youth was spent in domestic service, and it was first as attendant on a lady of fashion that she learned to develop her talent for singing and mimicry. Having lost this situation she became waitress in a tavern frequented by actors, and soon entered upon a gay and dissolute career. Her beauty attracted, among others, the painter Romney, who depicted her in no fewer than twenty-three of his works. Sir William Hamilton married her in 1791; and, going with him the same year to Naples, she speedily acquired an ascendancy over the mind of the queen, which, at the instigation of Nelson, she used for the advantage of the British fleet. On the death of Sir William she lived in a house at Merton Place, provided for her by Nelson, but on his death in 1805 she soon squandered the modest fortune left her by her husband, and after being imprisoned for debt, retired with Nelson's daughter, Horatia, to Calais, where she died January 16, 1815. Her *Memoirs* appeared in the year of her death.

HAMILTON, WILLIAM, a minor Scottish poet, the author of *The Braes of Yarrow*, was born in 1704, at

Bangour, in Linlithgowshire. He died at Lyons, March 25, 1754.

HAMILTON, SIR WILLIAM ROWAN, one of the really great mathematicians of the present century, was born in Dublin, August 4, 1805.

His genius displayed itself, even in his infancy, at first in the form of a wonderful power of acquiring languages. At the age of seven he had already made very considerable progress in Hebrew, and before he was thirteen he had acquired, under the care of his uncle, who was an extraordinary linguist, almost as many languages as he had years of age. Among these, besides the classical and the modern European languages, were included Persian; Arabic, Hindustani, Sanskrit, and even Malay. But though to the very end of his life he retained much of the singular learning of his childhood and youth, often reading Persian and Arabic in the intervals of sterner pursuits, he had long abandoned them as a study, and employed them merely as a relaxation.

His mathematical studies seem to have been undertaken and carried to their full development without any assistance whatever, and the result is that his writings belong to no particular "school," unless indeed we consider them to form, as they are well entitled to do, a school by themselves. As an arithmetical calculator he was not only wonderfully expert, but he seems to have occasionally found a positive delight in working out to an enormous number of places of decimals the result of some irksome calculation. At the age of twelve he engaged Colburn, the American "calculating boy," who was then being exhibited as a curiosity in Dublin, and he had not always the worst of the encounter. But, two years before, he had accidentally fallen in with a Latin copy of *Euclid*, which he eagerly devoured; and at twelve he attacked Newton's *Arithmetica Universalis*. This was his introduction to modern analysis. He soon commenced to read the *Principia*, and at sixteen he had mastered a great part of that work, besides some more modern works on analytical geometry and the differential calculus.

About this period he was also engaged in preparation for entrance at Trinity College, Dublin, and had therefore to devote a portion of his time to classics. In the summer of 1822, in his seventeenth year, he began a systematic study of Laplace's *Mécanique Céleste*. Nothing could be better fitted to call forth such mathematical powers as those of Hamilton; for Laplace's great work, rich to profusion in analytical processes alike novel and powerful, demands from the most gifted student careful and often laborious study.

Having detected an important defect in one of Laplace's demonstrations, he was induced by a friend to write out his remarks, that they might be shown to Doctor Brinkley, afterward bishop of Cloyne, but who was then royal astronomer for Ireland, and an accomplished mathematician. Brinkley seems at once to have perceived the vast talents of young Hamilton, and to have encouraged him in the kindest manner. He is said to have remarked in 1823 of this lad of eighteen,—"This young man, I do not say *will be* but *is*, the first mathematician of his age."

Hamilton's career at college was perhaps unexampled. Among a number of competitors of more than ordinary merit, he was first in every subject, and at every examination. His appointment to the Andrews professorship of astronomy in the university of Dublin, vacated by Doctor Brinkley, took place in 1827. Thus, when barely twenty-two, he was established at the Dublin Observatory. He was not specially fitted for the post, for although he had a profound acquaintance with theoretical astronomy, he had paid but little attention to the regular work of the practical astronomer.

In 1835, being secretary to the meeting of the British Association which was held that year in Dublin, he was knighted by the lord-lieutenant. But far higher honors rapidly succeeded, among which were his election in 1837 to the president's chair in the Royal Irish Academy, and the rare and coveted distinction of being made corresponding member of the academy of St. Petersburg. These are the few salient points (other, of course, than the epochs of his more important discoveries and inventions) in the uneventful life of this great man. He retained his wonderful faculties unimpaired to the very last, and steadily continued till within a day or two of his death (September 2, 1865) the task (his *Elements of Quaternions*) which had occupied the last six years of his life.

The germ of his first great discovery was contained in one of those early papers which in 1823 he communicated to Doctor Brinkley, by whom, under the title of *Cautistics*, it was presented in 1824 to the Royal Irish Academy. It was referred as usual to a committee. Their report, while acknowledging the novelty and value of its contents, and the great mathematical skill of its author, recommended that, before being published, it should be still further developed and simplified. During the next three years the paper grew to an immense bulk, principally by the additional details which had been inserted at the desire of the committee. But it also assumed a much more intelligible form, and the grand features of the new method were now easily to be seen. Hamilton himself seems not till this period to have fully understood either the nature or importance of his discovery, for it is only now that we find him announcing his intention of applying his method to dynamics. The paper was finally entitled *Theory of Systems of Rays*, and the first part was printed in 1828 in the *Transactions of the Royal Irish Academy*.

The step from optics to dynamics in the application of the method of "Varying Action" was made in 1827, and communicated to the Royal Society, in whose *Philosophical Transactions* for 1835 and 1834 there are two papers on the subject. These display, like the "Systems of Rays," a mastery over symbols and a flow of mathematical language almost unequaled.

The other great contribution made by Hamilton to mathematical science, the invention of QUATERNIONS, is fully treated under that heading. It is not necessary to say here more than this, that quaternions form as great an advance relatively to the Cartesian methods as the latter, when first propounded, formed relatively to Euclidian geometry.

HAMÍRPUR, or HUMEERPOOR, a British district in the lieutenant-governorship of the Northwestern Provinces, India, forms the southwestern district of the Allahábád division, and incloses the native states of Saríla, Jigní and Bihat, besides portions of Charkhári and Garrauli.

Hamírpur forms part of the great plain of Bundelkhand, which stretches between the banks of the Jumna and the central Vindhyan plateau. The district is in shape an irregular parallelogram, with a general slope northward from the low hills on the southern boundary. The scenery is rendered picturesque by the artificial lakes of Mahoba. These magnificent reservoirs were constructed by the Chandel rájás about 800 years ago, for purposes of irrigation and as sheets of ornamental water. Many of them inclose craggy islets or peninsulas, crowned by the ruins of granite temples, exquisitely carved and decorated. From the base of this hill and lake country the general plain of the district spreads northward in an arid and treeless level toward the broken banks of the rivers. Of these the principal are the Betwa and its tributary the Dhasán, both of which are

unnavigable. There is little waste land, except in the ravines by the river sides. The deep black soil of Bundelkhand, known as *már*, retains the moisture under a dried and rifted surface, and renders the district fertile. The last census gives a population of 529,137 — 276,196 males and 252,941 females. The Hindus numbered 493,877, and the Mahometans 33,658. The district contains six towns with a population of more than 5,000 souls, namely, Ráth, Hamírpur, Mahoba, Maudha, Sumerpur, and Jáitpur. The staple produce of the district is grain of various sorts, the most important being gram. Cotton is also a valuable crop, whose cultivation is on the increase. Out of a total area of 1,464,641 acres, 762,212 are under cultivation.

HAMÍRPUR, the administrative headquarters of the above district, is situated on a tongue of land at the confluence of the Betwa and the Jumna, on the right bank of the latter river. Population, 8,000.

HAMLET, the hero of Shakespeare's drama, is, according to some interpreters, an historical or quasi-historical personage, but according to others his story is a mere development or "precipitation" of the great Scandinavian system of mythology. The decision of this point is rendered all the more difficult as the only original authority for the facts (historical or mythological) is the Danish historian Saxo Grammaticus (d. 1204). Though Doctor Vigfusson (prolegomena to the *Sturlunga Saga*, Oxford, 1878) concludes that the Hamlet legend was contained in the Skjöldunga Saga now lost, it is of course matter of question whether Saxo based this portion of his narrative on previous writings or collected his material from oral traditions.

According to Saxo, Hamlet's history is briefly as follows: In the days of Rörik, king of Denmark, Gervendill was governor of Jutland, and in this office he was succeeded by his sons Horvendill and Fengo. The former, returning with glory from a viking expedition in which he had defeated Koller, king of Norway, obtained the hand of Gerutha, Rörik's daughter, who in due course bore him a son, Amleth. But Fengo, out of jealousy, murdered Horvendill with his own hand, and then persuaded Gerutha to become his wife, on the plea that he had committed the crime for no other reason than to avenge her of a husband by whom she had been hated. Amleth, afraid of sharing his father's fate, pretends to be imbecile, but the suspicion of Fengo puts him to various tests, which are related with all the inconsequent simplicity of the ordinary *Märchen*. Dispatched to England in company with two attendants, who bear a letter instructing the king of that country to put him to death, he surmises the purport of their instructions, and secretly modifies the inscription on their "tablets" so that the king is requested to put them to death and to treat him with honor. By his wisdom he makes a deep impression on the king, and obtains the hand of the royal princess; but, instead of settling in England, he returns at the end of a year to Denmark, where he is supposed to be dead, just as the people are celebrating his obsequies. During the feast that follows he makes the courtiers all drink freely, and then, when they are heavy with wine and sleep, he pulls down over them the hangings of the hall, fixes these with pegs which he had sharpened and prepared in the early stage of his folly, and then setting fire to the building leaves the revelers to their fate. He next proceeds to the royal chamber to take vengeance on Fengo himself, who falls beneath the stroke of his own sword, for which Hamlet had substituted his own scabbard-fastened weapon. Returning to England for his wife, the hero finds that his father-in-law and Fengo had been under pledge to each other that the survivor should avenge the other's death if it resulted from violence; and his father-in-law, unwilling to make a

direct attack on his life, sends him to Scotland as proxy-sutor for the hand of a terrible queen Hermuthruda, who has put all previous wooers to death. But Hermuthruda happens to fall in love with Hamlet, and he returns to England to upbraid his father-in-law with his treachery. As king of Jutland he has to endure the grievous hostility of Vileketus, Rörik's successor, but at last determines, though well aware that he is doomed to death in the attempt, to engage with him in a decisive battle. He perishes, and his widow marries Vileketus.

According to Latham, who may be taken as the representative of the historical theory, there are really two Hamlets—the Hamlet of Saxo's third book and the Hamlet of his fourth book, who have been confounded together. The former, who is the Shakespearean hero, he would identify with Olaf Kyrre; the Anlaf Cwiran of the Saxon Chronicle and the Amlaf Cuaran of the Irish Annals, whose name, having passed through England and Ireland, he supposes to have returned to Denmark in a form which is Latinized by Saxo as Amlethus; the latter he considers as the Hygelac of Beowulf, the Chochilaicus of Gregory of Tours, the Huhleikr of the Heimskringla, and even the Havelock of English legend.

That, in spite of the links by which Saxo has sought to connect its different portions with the authentic history of Denmark, the whole story was destitute of historical basis was maintained by P. E. Müller, and his conclusions in regard to the matter have been very generally accepted.

HAMM, a town of Prussia, capital of a circle in the government district of Arnberg, province of Westphalia, is situated at the junction of several railways, on the Lippe at its confluence with the Ahse, twenty-two miles northwest of Arnberg. Pop. about 22,000.

HAMMARSKÖLD, LORENZO (1785–1827), Swedish author, was born at Tuna, near Wimmerby. In 1818 appeared the first part of Hammarsköld's chief contribution to literature, his famous *Svenska Vitterheten*, a history of polite letters in Sweden, a book that was revised and republished after his death by Söndén, in 1833.

HAMME, a town of Belgium, in the province of East Flanders and the arrondissement of Termonde or Denkermonde, is situated on the right bank of the Durme, near its junction with the Scheldt, and eighteen miles east-northeast of Ghent. Pop. about 13,000.

HAMMER. This well-known tool stands quite without rival for producing the numberless effects which are due to the remarkable force of "impact." Of all the array of hand tools in use in the industrial arts it is undoubtedly the one that could least be dispensed with, and so it must have been from the very earliest days of handicraft. A hammer of some rude kind must have been as essential to the shaping of an arrow-head out of a flint, as is its modern representative to the forging of a bayonet out of a bar of steel.

Hammers to be used by hand are made of an endless variety of shapes, and of weights varying from a small fraction of an ounce to twenty-eight or thirty pounds. Of the various types now in use the differences are mainly due to the special requirements of the particular trades for which they are intended, but partly also to individual fancy.

Hand-hammers and sledge-hammers being rigidly limited as to weight by the trifling power which one man—or at most two men—can bring to bear upon them, it long ago became obviously desirable to obtain the force of impact from some more powerful source than human muscles, so that the weight of hammer heads might be largely increased and their blows made proportionately more effective. The first step taken in this direction seems to have been the introduction of

the "Hercules," a ponderous mass of iron attached to a vertical guide rod, which was lifted originally by a gang of men with ropes, but afterward by steam power, and allowed to fall by its own weight. This was a fairly efficient tool for forging large an-hors, and for similar purposes, the strength of the blow and the point at which it was delivered being easily regulated. But as the demand for wrought iron increased, the necessity for more rapid as well as more powerful hammers to aid in its manufacture increased also. The lift or helve hammer and the tilt hammer thus came into use, and under these forms hammers may be said to have ranked for the first time as true machine tools. Each of these consists of a heavy head attached to a beam mounted on gudgeons, which is lifted at regular intervals by suitable cams or pins carried by a revolving shaft driven by steam or other power, their chief points of difference being the relative position of the gudgeons and the portion of the beam at which the power is applied.

In the steam hammer which was first patented by Nasmyth in the year 1842, the inventor, produced a machine capable of being made to deliver its blows with a force to which no limit has yet been found, and yet set perfectly under control as to be able to crack a nut without injuring the kernel. To the introduction of this invaluable tool is due more than to any other single cause the power which we now possess of producing the forgings in iron and steel which are demanded by the arts of modern times; and in one or other of its many forms it is now to be met with in every workshop in which heavy work is carried on. Many modifications of the Nasmyth steam hammer have been introduced.

Duplex hammers differ materially from the ordinary steam hammer, inasmuch as no anvil is necessary,—two hammer heads of equal weight (and for some purpose they weigh only a few pounds, for others as much as thirty tons) being made to deliver horizontal blows of equal force simultaneously on opposite sides of the forging, which thus receive perfectly equal treatment. The importance of this may be gathered from the fact that every increase in the weight of the vertical steam hammer necessitates a very much larger increase in the weight and solidity of the anvil which is necessary to afford the requisite inertia for resisting the blow.

HAMMERFEST, the most northern town in Europe, is situated in the department of Hammerfest in the province of Finnmark, on the western side of the island of Kvalø, "Whale Island," which lies off the northwestern coast of Norway. Its latitude is 70° 39' 15", and the sun stays for two months above its horizon. Though a small place of about 2,100 inhabitants, it is the seat of a considerable trade.

HAMMER-HEAD. (See SHARK.)

HAMMER-PURGSTALL, JOSEPH VON, was born at Gratz, in 1774, and after some training in the Oriental academy of Vienna entered the Austrian diplomatic service. His youth and early manhood were passed in the Levant, where he bent all his energies to the task of improving his acquaintance with Oriental literature, in which as early as 1796 he proved his interest by the translation of a Turkish poem. He did not again come forward as an author till 1804, when his *Encyclopædia of Oriental Learning* appeared. From that time there was little pause in his literary productiveness. For fifty years he wrote incessantly on the most diverse subjects, and his works were composed in most of the languages of Europe. Von Hammer did for Germany the same work that Sir William Jones did for England. He showed that Oriental subjects were not to be studied merely so far as they were connected with biblical theology, but were a worthy object of research for their own sake. For more than fifty years he persisted in

introducing Eastern authors and Eastern topics to the general reader, and there was a time when no Orientalist was more widely known and admired. Von Hammer died on November 23, 1856, at the age of eighty-two.

HAMMERSMITH, a town and parish in the county of Middlesex, England, situated on the north bank of the Thames, and now connected with London by continuous lines of streets.

HAMMOND, HENRY (1605–1660), a learned royalist divine of the church of England, was born at Chertsey in Surrey, August 18, 1605. He was educated at Eton, when in his fourteenth year he passed to Magdalen college, Oxford, becoming demy or scholar in 1619, and fellow in 1625. After graduating in arts he turned his attention to divinity; in 1629 he entered holy orders, and in 1631 became bachelor of divinity. Hammond received his doctor's degree in 1639, and in 1643 was promoted to the dignity of archdeacon of Chichester. He was a member of the convocation of 1640, and also, but nominally only, of the Westminster assembly of divines, which began its sittings in 1643. In the latter year Doctor Hammond was concerned in the successful rising at Tunbridge in favor of King Charles I., and was obliged to flee in disguise to Oxford, then the royal headquarters. He was imprisoned under the commonwealth, and died in 1660.

HAMON, JEAN LOUIS, one of the best known of French painters under the second empire, was born at Plouha May 5, 1831. In 1848 he made his appearance at the Salon with *Le tombeau du Christ* (Musée de Marseille), and a decorative work, *Dessus de Porte*. The works which he exhibited in 1849—*Une Affiche Romaine*, *L'Égalité au Séraïl*, and *Perroquet jasant avec deux jeunes Filles*—obtained no marked success. Hamon was therefore content to accept a place in the manufactory of Sèvres, but an enameled casket by his hand having attracted notice at the London International Exhibition of 1851, he received a medal, and left his post to try his chances again at the Salon of 1852. *La Comédie Humaine*, which he then exhibited, turned the tide of his fortune; and *Ma sœur n'y est pas* (purchased by the emperor) obtained for its author a third-class medal in 1853. Hamon spent some time in Italy, chiefly at Capri, whence in 1864 he sent to Paris *L'Aurore* and *Un Jour de Fiançailles*. The influence of Italy was also evident in *Les Muses à Pompéi*, his sole contribution to the Salon of 1866, a work which enjoyed great popularity. His last work, *Le triste Rivaige*, appeared at the Salon of 1873. He died on May 29, 1874.

HAMPDEN, JOHN, the eldest son of William Hampden, of Great Hampden, in Buckinghamshire, by Elizabeth, second daughter of Sir Henry Cromwell, and aunt of Oliver, the future protector, was born in 1594. By his father's death, when he was but a child, he became the owner of a good estate, and a ward of the crown. He was educated at the grammar school at Thame, and in 1609 he became a commoner of Magdalen college at Oxford. In 1613 he was admitted a student of the Inner Temple, and in 1619 he married Elizabeth Symeon. He first sat in parliament for the borough of Grampound in 1621. From that time he was a member of every succeeding parliament till he died, 1643.

To the biographer who does not wish to become an historian under the pretense of narrating the incidents of his hero's life, Hampden's career must appear to give little scope for narrative. The letters which he left behind him are few. His speeches are scarcely more numerous, and are extremely brief. In the early days of his parliamentary career he was content to be overshadowed by Eliot, as in its latter days he was content to be overshadowed by Pym, and to be commanded by

Essex. Yet it is Hampden, and not Eliot or Pym, who lives in the popular imagination as the central figure of the English revolution in its earlier stages.

Something of Hampden's fame no doubt is owing to the position which he took up as the opponent of ship-money.

During the last two parliaments of James and the first three parliaments of Charles, Hampden did not, so far as we know, open his lips in public debate, but he was unceasingly employed in committee work, for which he seems to have had a special aptitude. In 1626 he took active part in the preparation of the charges against Buckingham. In January, 1627, he was bound over to answer at the council board for his refusal to pay the forced loan. Later in the year he was committed to the gate house, and then sent into confinement in Hampshire, from which he was liberated just before the meeting of the third parliament of the reign, in which he once more rendered useful but unobtrusive assistance to his leaders.

When the breach came in 1629 Hampden is found in epistolary correspondence with the imprisoned Eliot, discussing with him the prospects of the Massachusetts colony, or rendering hospitality and giving counsel to the patriot's sons now that they were deprived of a father's personal care. It was not till 1637, however, that his resistance to the payment of ship money gained for his name the luster which it has never since lost. Seven out of the twelve judges sided against him, but the connection between the rights of property and the parliamentary system was firmly established in the popular mind.

In the short parliament of 1640 Hampden stood forth among the leaders, and in the long parliament, though Hampden was by no means a frequent speaker, it is possible to trace his course with sufficient distinctness. Unwearied in attendance upon committees, he was in all things ready to second Pym, whom he plainly regarded as his leader.

There was one point on which there was no agreement. A large minority wished to retain Episcopacy, and to keep the Common Prayer Book unaltered, while the majority were at least willing to consider the question of abolishing the one and modifying the other. On this subject the parties which ultimately divided the House and the country itself were fully formed as early as February 8, 1641. The details of the contest between Episcopacy and Presbyterianism will be more fitly told in connection with the life of Pym. It is enough to say that Hampden fully shared in the counsels of the opponents of Episcopacy.

Every day Hampden's conviction grew stronger that Charles would never abandon the position which he had taken up. He was therefore a warm supporter of the Grand Remonstrance, and was chosen out to be one of the five impeached members whose attempted arrest brought at last the opposing parties into open collision. In the angry scene which arose on the proposal to print the Grand Remonstrance it was Hampden's personal intervention which prevented an actual conflict, and it was after the impeachment had been attempted that Hampden laid down the two conditions under which resistance to the king became the duty of a good subject. Those conditions were an attack upon religion, and an attack upon the fundamental laws. There can be no doubt that Hampden fully believed that both those conditions were fulfilled at the opening of 1642.

When the civil war began Hampden levied a regiment of Buckinghamshire men for the parliamentary cause. In the earlier operations of the war, and in the undecided fight of Edgehill, he bore himself gallantly and well. But it is not on his skill as a regimental officer

that Hampden's fame rests. In war as in peace his distinction lay in his power of disentangling the essential part from the non-essential. In the previous constitutional struggle he had seen that the one thing necessary was to establish the supremacy of the House of Commons. In the military struggle which followed, he saw, as Cromwell saw afterward, that the one thing necessary was to beat the enemy. His precious life was a sacrifice to his unselfish devotion to the call of discipline and duty. On June 18, 1643, when he was holding out on Chalgrove Field against the superior numbers of Rupert till reinforcements arrived, he received two carbine balls in the shoulder. Leaving the field, he reached Thame, and after nearly six days he died on the 24th praying for his country and his king.

HAMPDEN, RENN DICKSON (1793-1868), bishop of Hereford, was born at Barbados, and entered as a commoner at Oriel College, Oxford, in 1810. Having taken his B. A. degree with first-class honors in both the classical and mathematical schools in 1813, he, in the following year, obtained the chancellor's prize for a Latin essay *On the Office of the Ephors at Sparta*, and shortly afterward he was elected to a fellowship in his college, Keble, Newman, and Arnold being among the number of his contemporaries. Having left the university in 1816 he held successively the curacies of Newton, Faringdon, and Hackney, and in 1827 he published *An Essay on the Philosophical Evidence of Christianity*. In 1828 he returned to Oxford as tutor of Oriel, and, after having twice acted as public examiner in classics, he was selected to preach the Bampton lectures in 1832, when he chose for his subject *The Scholastic Philosophy considered in its Relation to Christian Theology*. Notwithstanding a charge of Arianism brought against him by the Tractarian party, he, in 1833, obtained the principalship of St. Mary's Hall, in 1834 the chair of moral philosophy, and the regius professorship of divinity in 1836. There resulted a widespread and violent though ephemeral controversy, after the subsidence of which he published a *Lecture on Tradition*, which has passed through several editions, and a volume on *The Thirty-nine Articles of the Church of England*. His nomination by Lord John Russell to the vacant see of Hereford in December, 1847, was again the signal for a violent and organized opposition; and his consecration in March, 1848, took place in spite of a remonstrance by many of the bishops. He died in 1868.

HAMPSHIRE, HANTS, or SOUTHAMPTON, a maritime county in the south of England, is bounded on the north by Berkshire, on the east by the counties of Surrey and Sussex, on the south by the English Channel, and on the west by Wiltshire and Dorsetshire. It is of an irregular quadrilateral form, its greatest breadth from north to south, not including the Isle of Wight, is forty-six miles and its greatest breadth from east to west forty-one miles. The total area comprises 1,302,105 imperial acres (mainland portion 938,764 acres, Isle of Wight 93,341), or nearly 1,613 square miles. Hampshire in its general aspect presents a beautiful variety of gently rising hills and fruitful valleys, adorned with numerous mansions and pleasant villages, and interspersed with extensive woodland. Two ranges of low chalk hills, known as the North and South Downs, enter the county from Surrey and Sussex respectively, and traverse it in a northwesterly direction into Wiltshire and Berkshire. The coast on the whole is low and irregular. The most easterly part forms a large bay containing Hayling Island and Portsea Island, which divide it into Chichester harbor, Langston harbor, and Portsmouth harbor. From the southwestern extremity of Portsmouth harbor it runs about eighteen miles inland in a northwest direction, and forms South-

ampton Water, which has a western shore about ten miles in length, and an average breadth of nearly two miles at high water. From Southampton Water its line is continued irregularly in a southwestern direction—for nearly one-half of its extent fronting the Isle of Wight, and in its western half forming Christchurch Bay and part of Poole Bay.

The principal rivers are the Avon, the Boldre, the Exe, the Test with its tributary the Anton, the Itching, and the Hamble.

According to recent agricultural statistics, the total area of arable land was 706,927 imperial acres, of which 247,958 were under corn crops, 135,982 under green crop, 112,813 under rotation grasses, 184,141 permanent pasture, and 22,967 fallow. The acreage under woods was 87,229. The principal grain crop is wheat, for which Hampshire enjoys great celebrity. Its acreage has been gradually increasing, and at the time mentioned was 100,090. Hops are extensively grown in the eastern part of the county bordering on Surrey. Their acreage was 3,064. Farming is generally conducted on the best modern principles, but owing to the varieties of soil there is perhaps no county in England in which the rotation observed is more diversified, or the processes and methods more varied. Most of the farms are large, and there is a considerable number of modern farms. The waste land has been mostly brought under tillage, but a very large acreage of the ancient forests is still occupied by wood. New Forest has 60,000 acres under wood, was originally formed by William the Conqueror in 1079, after the battle of Hastings, and the greater part of it belongs to the crown. The trees of the forest are principally beech and oak. The oaks, many of which are some hundred years old, do not grow to a great height, but shoot out strong, crooked branches which give them a very picturesque appearance. Formerly they were chiefly used for the ships of the royal navy. Herds of small ponies similar to those of Shetland and the Hebrides are still reared in the forest. It also contains abundance of deer. Pop. of county (1901), 377,118.

Among the eminent persons connected with Hampshire may be mentioned Young, author of *Night Thoughts*; Warton, author of the *History of English Poetry*; Dibdin, Bishop Wykeham, Pococke the traveler, Sir William Petty, Jonas Hanway, Brunel, Gilbert White, John Keble, and Charles Dickens.

HAMPSTEAD, a suburb of London, is situated in the county of Middlesex, on the slope of Hampstead Hill, four miles northwest of the city. Hampstead Heath, an irregular sandy tract occupying the summit and northern slope of the hill, and extending to two hundred and forty acres, is much frequented by excursionists and picnic parties. The hill is the highest in the vicinity of the metropolis, being four hundred and forty-three feet above the level of the Thames, or thirty-six feet higher than the cross of St. Paul's. At one time the village was a favorite resort of poets and other men of letters; and among the more famous of its old taverns was the Flask Inn, now converted into a private residence, the meeting-place of the Kit-Cat club, of which the more celebrated members were Addison, Steele, Richardson, Marlborough, and Walpole. The parish church of St. John is a plain brick structure in the Italian style, with a picturesque tower. The graveyard contains a number of monuments of eminent persons, including those of Sir James Mackintosh, Joanna Baillie, and Constable the artist.

HAMPTON, a village in the county of Middlesex, England, is situated on the north bank of the Thames, twelve miles west-southwest from Hyde Park Corner.

About a mile from Hampton village and close to the

river stands Hampton Court Palace, one of the finest extant specimens of the Tudor style of architecture, and formerly a royal residence. It was originally erected by Cardinal Wolsey, who in 1515 received a lease of the old mansion and grounds of ninety-nine years. As the splendor of the building seemed to awaken the cupidity of Henry VIII., Wolsey in 1526 thought it prudent to make him a present of it. It became Henry's favorite residence, and he made several additions to the building, including the great hall and chapel in the Gothic style. Of the original five quadrangles only two now remain, but a third was erected by Sir Christopher Wren for William III. The fine gardens, extending to forty-four acres, were laid out at the desire of William III. in the Dutch style, with elevated terraces, long shady walks, and a labyrinth called the "Maze," which is the source of great amusement to visitors. Bushy Park, opposite the palace gardens, is open to the public, and contains a celebrated avenue of chestnut trees. The palace was sold by the parliament in 1641, but afterward came into the hands of Cromwell; and it continued to be one of the principal residences of the English sovereigns until the time of George II.

HAMPTON, the capital of Elizabeth City county, Va., is situated at the mouth of the James river, on the north side of Hampton Roads, and has considerable repute as a watering-place. It is the seat of Hampton Normal Institute (colored), and possesses some manufacturing. There is a large trade in oysters and fish. Population (1900), 2,764.

HAMPTON ROADS, a roadstead at the mouth of the James river, separating Fortress Monroe from Sewall's Point, Va. It was the scene of the sinking of the United States war-vessel *Cumberland*, and destruction of the *Congress* by the Confederate iron-clad, *Merrimac*, in March, 1862. On the ninth of that month the *Monitor*, a vessel of novel construction, devised by John Ericsson, drove the Confederate vessel back toward Norfolk harbor, whence, on May 11th, she was taken to Craney Island and blown up by the Confederates, the detachment destroying her being under command of an English naval officer, Charles H. Harker, then in the service of the Confederacy.

HAMSTER (*Cricetus*), a genus of rodent mammals belonging to the *Muride* or mice family, and characterized by the possession of large cheek pouches. The common Hamster (*Cricetus vulgaris*) is somewhat larger and stouter than the Norway rat, but with a much shorter tail. Its fur, which varies somewhat in color, is generally of a reddish-brown above and black beneath, with several white spots on the sides. It is found throughout the dry regions of central Europe and Asia, from the Rhine eastward to the river Obi, and southward to Persia and the Caucasus. It is a burrowing animal, its subterranean dwelling consisting of several vaults, most of which are used as storehouses for the grain and seeds which the hamster lays up in autumn for consumption during winter and spring. In collecting this store it makes use of its cheek pouches, which are said to be large enough to contain a quarter of a pint, while the hoard of a single individual will sometimes contain about two bushels of grain. It is thus specially obnoxious to the farmer, who loses no opportunity of destroying the creature and of ransacking its stores. Like many other rodents the hamster is exceedingly prolific, the female producing several broods in the year, each consisting of over a dozen young, and these when not more than three weeks old are turned out of the parental burrow to form underground homes for themselves. The burrow of the young hamster is only about a foot in depth, while that of the adult descends four or five feet beneath the surface. On the

approach of winter the hamster retires to its subterranean abode, the various entrances to which it carefully closes, and there it remains until the advent of milder conditions, feeding, for a while on its well-garnered store, but becoming torpid during the coldest period of the winter.

HANAU, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is situated at the confluence of the rivers Kinzig and Main, twelve miles east of Frankfurt. Hanau is the birthplace of the brothers Grimm, and the house in which they were born is now adorned with a medallion. In the neighborhood of the town are the electoral palace, with an extensive park and large orangeries, and the watering-place of Wilhelmsbad. Hanau is the principal commercial and manufacturing town in the province, and stands next to Cassel in point of population, which is about 25,000.

HANCOCK, JOHN, statesman, was born at Quincy, Mass., January 12, 1737. Having taken his degree at Harvard university in 1754, he began a mercantile career, and on the death of an uncle in 1764 succeeded to a large fortune and a prosperous business. In 1768, two years after his election to the Massachusetts House of Representatives by the city of Boston, his sloop *Liberty* was seized for contravention of the commercial laws, and in the riot which followed the royal customs commissions barely escaped with their lives. After the "massacre" of Boston in 1770, Hancock inveighed with such spirit and bitterness against the troops and their officers, demanding their removal from the town, that he became obnoxious to the government; and afterward the attempt to seize his person led to the first revolutionary battle at Concord, Mass. In 1774 Hancock was president of the provincial congress, and from 1775 to 1777 of the general congress at Philadelphia, where he was the first to sign the declaration of independence. Returning to Massachusetts he assisted in framing the constitution, and in 1780 was chosen first governor. He was annually elected to this dignity till 1785, and again from 1787 to 1793, sitting as an ordinary member of the legislature in the interval. He received the degree of LL.D. from Harvard university in 1792. He died at Quincy, October 8, 1793.

HANDEL, GEORGE FREDERICK, one of the greatest names in the history of music generally, is absolutely paramount in that of English music. His influence on the artistic development of England and his popularity, using that word in the most comprehensive sense, are perhaps unequaled. He has entered into the private and the political life, as well as into the art life of Englishmen; without him they cannot bury their dead or elect their legislators; and never has a composer been more essentially national than the German Handel has become in England. It may on the other hand be said that but for his sojourn in that country, Handel would never have been what he was. It was under the influence of English poetry, and of English national and religious life, that his artistic conception broadened and gained the dignity and grandeur which we see in his oratorios, and which was wanting, and, seeing the style of art, could not but be wanting, in his Italian operas. George Frederick Handel (in German the name is always *Händel*) was born at Halle in Saxony on February 23, 1685, the same year which gave birth to his great fellow composer Johann Sebastian Bach. He was the son of George Handel, who, according to the custom of the time, combined the occupation of barber and surgeon, and subsequently was valet-de-chambre to the elector of Saxony. His father was sixty-three years old when Handel was born, and the musical talent shown by the youth at a very early age, found

little encouragement from the stern old gentleman, who looked upon art with contempt, and destined his son for the law. The boy's first attempts at composition date from an early period, and in his twelfth year he made his debut as a virtuoso at the court of Berlin with such success that the elector of Brandenburg, afterward King Frederick I. of Prussia, offered to send him to Italy, a proposal declined by Handel's father for unknown reasons. In 1697 the latter died, and the young artist was henceforth thrown on his own resources. For some years he remained in Halle, where in 1702 he obtained a position as organist; but in the following year we find him at Hamburg, at that time one of the musical centers of Germany. There the only German opera worth the name had been founded by Reinhold Keiser, the author of innumerable operas and operettas, and was flourishing at the time under his direction. Handel entered the orchestra, and soon rose from his place among the second violins, to the conductor's seat at the clavicembalo, which he occupied during Keiser's absence. It was at Hamburg that he became acquainted with Mattheson, a fertile composer and writer on musical subjects.

The year 1705 witnessed Handel's first dramatic attempt—a German opera, *Almira*, performed at Hamburg on January 8, 1705, with great success, and followed a few weeks later by another work of the same class, *Nero* by name. In 1706 he left Hamburg for Italy, at that time still the great school for music, to which, indeed, Handel himself owed his skill and experience in writing for the voice. He remained in Italy for three years, living in Florence, Rome, Naples and Venice. His compositions, during his Italian period, were two operas, two oratorios, *Resurrezione* and *Il Trionfo del Tempo e del Disinganno*, afterward developed into the English oratorio *The Triumph of Time and Truth*, and numerous other choral work. It was during these years that the composer's earlier or Italian style reached its full maturity and that his name became widely known in the musical world. In the chief cities of Italy, "il Sassone," as Handel, like his countryman Hasse, twenty years later, was nicknamed, was received with every mark of favor and esteem. But his own country also began to acknowledge his merits. At Venice, in 1709, Handel received the offer of the post of capellmeister to the elector of Hanover. The composer at the time contemplated a visit to England, and he accepted the offer only on condition of leave of absence being granted to him for that purpose. To England accordingly Handel journeyed after a short stay at Hanover, arriving in London toward the close of 1710. Curiously enough he came as a composer of Italian opera, and in that capacity he earned his first success at the Haymarket with the opera *Rinaldo*, composed, it is said, in a fortnight, and first performed on February 24, 1711. The beautiful and still universally popular air "Lascia ch'io pianga" is from this opera. A similar air, in the form of a *sarabande*, occurs in *Almira*. After the close of the season in June of the same year, Handel seems to have returned to Germany for a short time; but the temptation of English fame or English gold proved too powerful, and in January, 1712, we find him back in London, evidently little inclined to return to Hanover in spite of his duties at the court there. Two Italian operas, the celebrated *Utrecht Te Deum*, written by command of Queen Anne, and other works, belong to this period. It was in such circumstances, somewhat awkward for the composer, when his deserted master came to London as George I. of England. Neither was the king slow in resenting the wrongs of the elector. For a considerable time Handel was not allowed to appear at court, and it was only through the intercession of his patron, Baron Kielman-

segge, that his pardon was at last obtained. Commissioned by the latter, Handel wrote his celebrated *Water-Music*, which was performed at a great fête on the Thames, and so pleased the king that he at once received the composer to his good graces. A salary of £200 a year granted to Handel was the immediate result of this happy consummation. In 1716 he followed the king to Germany, where he wrote a second German, "Passion," the words this time being supplied by Brockes, a well-known poet of the day. After his return to England he entered the service of the duke of Chandos, as conductor of his private concerts. In this capacity he resided for three years at Cannons, the duke's splendid seat near Edgware, and produced the two *Te Deums* and the twelve anthems surnamed *Chandos*. The English pastoral, *Acis and Galatea* (not to be mistaken for the Italian cantata of that name written at Naples, with which it has nothing in common), and his first oratorio to English words, *Esther*, were written during his stay at Cannons. It was not till 1720 that he appeared again in a public capacity, that of impresario of an Italian opera at the Haymarket theater, which he managed for the so-called Royal Academy of Music. Senesino, a celebrated singer, to engage whom the composer specially journeyed to Dresden, was the mainstay of the enterprise, which opened with a highly successful performance of Handel's opera *Radamisto*. *Muzio Scévola*, written in conjunction with Buononcini and Arfosti, *Tamerclane*, *Rodelinda*, and other operas composed for the same theater, are now forgotten, only detached songs being heard at concerts. To this time also belongs the celebrated rivalry of Handel and Buononcini, a gifted Italian composer, who, by his clique, was declared to be infinitely superior to the German master. The controversy raised a storm in the aristocratic teapots, and has been generally, but erroneously, attributed to Swift, and in reality written by John Byrom:

Some say, compared to Buononcini,
That Myneer Handel's but a ninny:
Others aver that he to Handel
Is scarcely fit to hold a candle.
Strange all this difference should be
Twixt Tweedle-dum and Tweedle-dee.

The contest was essentially of a personal nature, and in these circumstances it is hardly necessary to add that Handel remained victorious. Buononcini for a reason not sufficiently explained left London, and Handel was left without a rival. But in spite of this his connection with Italian opera was not to be a source of pleasure or wealth to the great composer. For twenty years the indomitable master was engaged in various operatic ventures, in spite of a rival company under the great singer Farinelli, started by his enemies—in spite also of his bankruptcy in 1737, and an attack of paralysis caused by anxiety and overwork. Of the numerous operas produced by him during this period it would be needless to speak in detail. Only the name of the final work of the long series, *Deidamia*, produced in 1741, need be mentioned here.

It is a question whether Handel's change from opera to oratorio has been altogether in the interest of musical art. The opera lost in him a great power, but it may well be doubted whether dramatic music such as it was in those days would have been a proper mold for his genius. Neither is it certain that that genius was, strictly speaking, of a dramatic cast. There are no doubt in his oratorios—for in these alone Handel's power is displayed in its maturity—examples of great dramatic force of expression; but Handel's genius was in want of greater expansion than the economy of the drama will allow of. It was no doubt for this reason that from an inner necessity he created for himself the

form of the oratorio, which in spite of the dialogue in which the plot is developed is in all essentials the musical equivalent of the epic. This breadth and depth of the epic is recognized in those marvelous choral pieces expressive either of pictorial detail (as the gnats and the darkness tangible and impenetrable in *Israel in Egypt*) or of the combined religious feeling of an entire nation. By the side of these even the finest solo pieces of Handel's scores appear comparatively insignificant, and we cannot sufficiently wonder at the obtuseness of the public which demanded the insertion of miscellaneous operatic arias as a relief from the incessant choruses in *Israel in Egypt* at the second performance of that great work in 1740. The *Messiah* is the musical equivalent of Milton's *Paradise Lost*. This leads us to another and equally important aspect of the same subject—the important influence of English poetry on Handel's works. Not only are some of the greatest names of English literature—Milton (*Allegro and Penseroso*), Dryden (*Alexander's Feast*) Pope (*St. Cecilia's Ode*)—immediately connected with Handel's compositions, but the spirit of these poets, and especially of Milton, pervades his oratorios even when he has to deal with the atrocious doggerel of Morell or Humphreys. The following is a chronological list of Handel's English oratorios taken from the catalogue of his works appended to Mr. J. Marshall's article in Grove's *Dictionary of Music and Musicians*, vol. i. p. 657: *Esther* (1720), *Deborah* (1733), *Athalie* (1733), *Saul* (1738), *Israel in Egypt* (1738), *Messiah* (1741), *Samson* (1741), *Joseph* (1743), *Hercules* (1744), *Belshazzar* (1744), *Occasional* (1746), *Judas Maccabeus* (1746), *Alexander Balas* (1747), *Joshua* (1747), *Solomon* (1748), *Susanna* (1748), *Theodora* (1749), *Jephthah* (1751), *Triumph of Time and Truth* (1757). The sequence of these dates will show that the transition from Italian opera to sacred music was gradual, and caused by circumstances rather than by premeditated choice. The remainder of Handel's life may be told in few words. He for a second time became a bankrupt in 1745, but nothing, not even his blindness during the last six years of his life, could daunt his energy. He worked till the last, and attended a performance of his *Messiah* a week before his death, which took place on April 14, 1759. He was buried in Westminster Abbey. His monument is by Roubilliac, the same sculptor who modeled the statue erected during Handel's lifetime in Vauxhall Gardens.

HAND TOOLS. Within the limits of the present article it would be impossible to describe even the majority of the instruments which may come under this designation, including as its does (in its popular if not in its technical sense) the whole of the appliances used by the handicraftsman in the treatment, by means of his muscular energy, of the natural substances used in the arts and manufactures,—whether in the preliminary operations of setting-out and measuring his materials, in reducing his work to the required form by cutting tools or otherwise, in gauging it and testing its accuracy, or in duly securing it while being thus treated. Omitting therefore the large but by no means unimportant class of measuring and gauging instruments, straight edges, templates, etc., we will confine our attention to examples of those in the use of which an actual expenditure of force is necessary. According to the structure and other properties of the materials to be treated by them, these act almost without exception either by impact, by pressure, or by cutting, the last being effected sometimes with impact and sometimes with pressure. The principal tools acting purely by impact are noticed under **HAMMER**, (*q.v.*)

It should be observed that the term "cutting" is

applied to processes which have but little in common, the great differences of structure in the materials operated upon demanding equally great differences in the modes of effecting the desired end, which is in almost all cases the forcible separation of their particles in some regular and definite manner. If we regard, for example, the action of a sharp knife upon a piece of chalk as one of true cutting,—*i.e.*, the separation of its particles by the forcible insertion of a wedge-like blade of superior hardness to itself,—we shall find that in by far the larger proportion of instances this simple action is rendered complicated, either through the substance under treatment being insufficiently compact to afford in itself the necessary resistance, or through its want of homogeneity causing a tendency in it to part more readily in some directions than in others. Thus all kinds of wood and the generality of both vegetable and animal substances, being cellular or fibrous in their structure, offer so much less resistance in a direction parallel to the fibers than in one transverse to them that in the former case many of them may be parted by fissure without any true cutting at all. So also with crystalline materials—as is beautifully exemplified by the diamond, which lends itself to cleavage in certain planes in the most perfect manner, though the steel chisel which is employed for the process is very much inferior in hardness to itself. Metals also are frequently not homogeneous; indeed, they are sometimes said to be fibrous in structure, but it is only to a very limited extent, if at all, that they are so, and their great natural tenacity even then prevents the separation of their particles except by a true cutting process. Lastly, some stones and minerals, such as sandstones, are said to be cut, though they are formed of material considerably harder than the tools which are used upon them, the fact being that their hard particles are not cut at all, but are merely separated from one another when the cementing material which holds them together is compelled to give way.

Cutting or edge tools are mainly of two classes—(i.) cutting tools used with impact, and (ii.) cutting tools used mainly with pressure. These again may be subdivided into tools used (1) for wood and soft materials, (2) for metal, and (3) for stone and hard substances.

Wood-tools cutting by impact comprise all the varieties of axes and adzes, such as the ordinary English pattern of carpenter's ax, the woodman's felling ax, the wedge ax (which was one of the first American improvements in edge tools introduced into Europe), and the shipwright's adze, which last is a particular rapid and efficient tool in skillful hands. All these when used in the direction of the grain of the wood act by cleaving rather than by cutting, except when the thickness of the chip removed is so small that its transverse strength is inferior to the lateral tenacity of the fibers. So also do chisels and gouges when driven by blows from a hammer or mallet.

In the case of *metals* their hardness in general almost precludes the possibility of employing them upon any tools corresponding to the above. If we except a few special tools such as plumbers' knives, etc., chisels will be found to be almost the sole representatives of this class.

Tools of this class for *stone* also consist chiefly of chisels, the mason's chisel varying greatly in width of edge according to the variety of stone and the depth of the cut to be taken.

A sharp knife serves well for showing the different kinds of treatment by cutting or by fissure to which any particular wood or other moderately soft material is capable of submitting itself. The "thickness" of the cutting edge, or in other words, the angle which the

intersecting planes which include it form with one another, the degree of smoothness or roughness of edge which best effects the clean division or separation of the fibers, and the possibility or otherwise of producing a smooth surface by "scraping," can all to a great extent be judged of with the aid of a knife. And the subject is by no means an unimportant one. Consideration of the action which takes place at the edge of a cutting-tool, and the strain which this action produces on particular portions of it are frequently of service in enabling us successfully to meet the special cases which arise in practice, and may sometimes guide us toward remedying the defective action of the hand-tools in use for ordinary work. America has long taken the lead in originating thoughtful improvements of this kind, and the result is apparent in the rapid manner in which the use of edge tools and appliances of American patterns is now everywhere extending.

Cutting tools for metal analogous to the foregoing are but few as regards surface work. Their chief characteristic—at least in the case of those used for the harder metals—is the greatly increased thickness of their edges. Files of various cross sections, lengths, and degrees of fineness of tooth; and scrapers (which are merely thick knife-edges, and not unfrequently from worn-out files by sharpening them at the extremity), constitute about the only edge tools at the disposal of fitter or mechanic for finishing work that he has roughly surfaced with his chipping chisels.

Stone and hard materials cannot in general be treated by cutting tools simply with hand pressure, though some of the softer kinds of stone are carved with chisels used almost or altogether without impact, and are sawn with toothed saws resembling the cross-cut saws used for wood. Glaziers' diamonds were till recently the only tools for producing the peculiar "cut" requisite for starting the clean fracture by which sheet glass is divided, theirs, however, being a case of fissure rather than of true cutting. But of late years steel glass cutters have been introduced which act—as long as the sharpness of their edges is maintained—in a manner precisely similar. Diamonds, however, are used for cutting glass, stone, etc., by actually detaching their particles; writing diamonds and diamond drills have this kind of action.

Of subsidiary tools the vice is an absolute essential for the generality of metal workers. The ordinary tail-vice used by mechanics has not yet been largely superseded, though many ingenious arrangements have been devised or remedying its main defect, viz., the want of parallelism in the movement of the jaws.

Hand-vices are used in the manner implied by their name, without being attached to a bench like the foregoing. The screw wrench, which is used for turning nuts, etc., of various sizes, has of late been deservedly the subject of various improvements in which weight is sought to be saved without sacrifice of strength; and the shifting spanner, of which the duty is the same, has led to the exercise of much ingenuity without any perfectly satisfactory solution of the problem how it may best be constructed. The merit and simplicity of the ordinary screwdriver, on the other hand, are well known.

Instances of tools which afford a powerful grip by simple means are the blacksmith's tongs, the vice-chop tongs, the pliers and the pincers.

HANG-CHOW-FOO, a city of China, in the province of Che-Keang, about two miles northwest of the Tseentang-Keang, at the southern terminus of the Imperial Canal by which it communicates with Peking. It lies about 100 miles southwest of Shanghai. Toward the west is the Si-hu or "Western Lake," a beautiful sheet

of water, with its banks and islands studded with villas, monuments and gardens, and its surface traversed by gayly-painted pleasure boats. To the Chinese it is a very paradise. Exclusive of extensive and flourishing suburbs, the city has a circuit of twelve miles; its streets are well paved and clean, and it possesses a large number of arches, public monuments, temples, hospitals and colleges. It has long ranked as one of the great centers of Chinese commerce and Chinese learning. The silk manufactures alone are said to give employment to 60,000 persons within its walls, and it has an extensive production of gold and silver work and tinsel paper. On one of the islands in the lake is the great Wan-lan-ko, or pavilion of literary assemblies, and it is said that at the examinations for the second degree twice every three years from 10,000 to 15,000 candidates come together. In the northeast corner of the city is the Nestorian church, which was noted by Marco Polo, the façade being "elaborately carved, and the gates covered with elegantly wrought iron." There is a Roman Catholic mission in Hang-chow, and the Church Missionary Society, the American Presbyterians and the Baptists have likewise stations. The local dialect differs from the Mandarin mainly in pronunciation. The population, which is remarkable for gayety of clothing, was formerly reckoned at 2,000,000, but is now (1902) estimated at 600,000 or 700,000.

Hang-chow-foo is the Kinsai of Marco Polo, who describes it as the finest and noblest city in the world, and speaks enthusiastically of the number and splendor of its mansions, and the wealth and luxuriance of its inhabitants. According to his authority it had a circuit of 100 miles, and no fewer than 12,000 bridges, and 3,000 baths.

HANKA, WENCESLAUS or WAKLAW (1791-1861), a Bohemian philologist, was born at Horenioves, a hamlet of eastern Bohemia, on June 10, 1791. On September 16, 1817, Hanka made the discovery of some ancient Bohemian manuscript poems of the thirteenth and fourteenth centuries, in the church tower of the village of Kralodwor, or Königinhof. These were published, in 1818, under the title *Kralodworsky Rukopis*, with a German translation by Swoboda. Great doubt, however, was felt as to their genuineness; and Dobrowsky, by pronouncing *The Judgment of Libussa*, another manuscript found by Hanka, an "obvious fraud," confirmed the suspicion. But some years afterward Dobrowsky saw fit to modify his decision; and, in 1840, after a careful examination of the manuscripts by two eminent antiquaries, Hanka was ultimately vindicated. A translation into English, *The Manuscript of the Queen's Court*, was made by Wratistlaw in 1852. The originals were presented by the discoverer to the Bohemian Museum at Prague, of which he was appointed librarian in 1818. In 1848 Hanka took part in the Slavonic congress, and other peaceful national demonstrations, being the founder of the political society, Slovanska Lipa. He was elected to the imperial diet at Vienna, but declined to take his seat. In the winter of 1848 he became lecturer, and, in 1849, professor of Slavonic languages in the university of Prague, where he died, January 12, 1861.

HANKOW (that is, the "Mouth of the Han"), the great commercial center of the middle portion of the Chinese empire, and since 1858 one of the principal places opened to foreign trade. It is situated on the northern side of the Yang-tse-kiang at its junction with the Han river, about 450 miles west of Shanghai at a height of 150 feet. By the Chinese it is not considered a separate city, but as a suburb of the now decadent city of Hanyang; and it may almost be said to stand in a similar relation to Wu-chang the capital of the prov-

ince of Hupeh, which lies immediately opposite on the southern bank of the Yang-tse-kiang. Hankow extends for about a mile along the main river and about two and a half along the Han. It is protected by a wall eighteen feet high, which was erected in 1863 at an expense of £250,000, and has a circuit of about four miles. In 1861 the port was declared open by James Hope and Sir Harry S. Parkes, and the site of a British settlement was selected in the east end of the town. Before the Taiping wars, the full brunt of which fell upon this part of the country, the sister cities of Hankow, Han-yang, and Wu-chang-fu had a population, it is said, of over 5,000,000. At present Hankow has from 600,000 to 800,000 (Sossnoffsky says only 300,000), and the other two from 400,000 to 700,000.

HANLEY, a market-town and municipal borough of the Staffordshire, England, is situated in the center of the pottery district, eighteen miles north of Stafford. It owes its prosperity to its pottery manufactures, which include porcelain, encaustic tiles and earthenware; and give employment to the greater part of the population, women and children being employed almost as largely as men. In the neighborhood coal and iron are obtained. Hanley, which includes the former township of Shelton, received a municipal constitution in 1857. It is the central and most important of the group of towns constituting the parliamentary borough of Stoke-upon-Trent. The population of Hanley is 45,000.

HANNAY, JAMES, critic, novelist, and publicist, was born at Dumfries in 1827. He entered the navy in 1840 and served till 1845, when he adopted literature as his profession. In 1857 Hannay contested the Dumfries burghs in the Conservative interest, but without success. He edited the *Edinburgh Courant* from 1860 till 1864, when he removed to London. In July 1868 he was appointed British consul at Barcelona, a post which he occupied till his death on January 8, 1873. Hannay's best books are *Singleton Fontenoy, Satire and Satirists*, *Eustace Conyers*, and *Essays from the Quarterly Review*.

HANNIBAL. Hannibal is a very common Carthaginian name. Its final syllable *bal* occurs repeatedly as a suffix in Punic names, and is in fact taken from the chief Phœnician deity, Baal. The entire name denotes, according to a probable interpretation, "the favor of Baal."

The famous Hannibal, the hero of the Second Punic War, was the son of Hamilcar Barca, and was born in 247 B.C. He and his two brothers, Hasdrubal and Mago, were called by the father "the lion's brood." At the age of nine he begged his father, who was leaving Carthage for Spain, to take him with him. The request was granted, but not before he had sworn at that father's bidding on the altar of sacrifice eternal enmity to Rome. That vow determined his life's future. In Spain he was bred up in camps under his father's eye. He was present at the battle in which his father fell in 228 B.C., being then in his nineteenth year. Hamilcar's son-in-law Hasdrubal, succeeded to the command. Eight years afterward, in 221 B.C., he was struck down by an Iberian assassin. Meantime the young Hannibal had proved himself thoroughly able both to obey and to command, and the soldiers with one voice at once hailed him as their general.

His first object was to complete the work of his father and his father's successor. Spain, he felt, must be more thoroughly overawed, if it was to be the base of operations against Rome. He pushed into the heart of the country, crossed the Tagus, and crushed the resistance of the tribes of the interior. Two campaigns sufficed for the conquest of all Spain to the south of the Ebro, except Saguntum, a town considerably south of the Ebro

and some way to the north of the modern Valencia. It was a Greek colony from Zacynthus (Zante), and had grown into a rich and prosperous place, but, what was now far more important, it was in friendly relation with Rome. To attack it therefore would be like throwing down the gauntlet to the Roman Senate and people. But Hannibal was able to tell the home government at Carthage that the Saguntines were molesting Carthaginian subjects in the neighborhood. Without awaiting an answer he began the siege. Roman ambassadors at the solicitation of envoys from Saguntum landed on the coast, but were told by Hannibal that he could not see them. They went on to Carthage, but their remonstrances, though the subject of a long debate, were in vain. Eight months passed away, and Saguntum, after a gallant defense, was forced to surrender. Hannibal got a rich booty for his army, and went into winter quarters at New Carthage (Cartagena). Again a Roman embassy went to Carthage and insisted on his being given up. The demand was refused. By the close of the year 219 B.C. the Second Punic War was in fact begun.

Hannibal's resolution was now taken. He prepared at once to invade Italy. He had a numerous and efficient army and a well-filled exchequer. All who shrink from the expedition he dismissed to their homes. In the spring of 218 B.C. he began his great march from New Carthage with an army of 90,000 foot and 12,000 horse and thirty-seven elephants. The Ebro was easily crossed. In the country beyond he had some fighting to do with the native tribes, and there he left Hanno, with a force of 10,000 foot and 1,000 horse to secure the pass between Spain and Gaul. Again he sent back all in whom he saw signs of hesitation. With a considerably diminished army he passed the Pyrenees at Bellegarde and encamped at Iliberris (Elne). Some Gallic tribes, alarmed at his advance, had assembled in the neighborhood, but he soon conciliated their chiefs and persuaded them that he meant them no mischief. So he continued his march without molestation to the Rhone.

Meanwhile the Romans had done little or nothing to check their enemy. At last the consul, Publius Cornelius Scipio, arrived at Massilia (Marseilles), and was surprised to find that Hannibal was about to cross the Rhone. But he was too late to oppose the passage, and Hannibal crossed the river probably at some point near the village of Roquemaure. He then followed its course, marching up its left bank to its junction with the Isère at Valence, and entered what was known as the "Island of the Allobroges." It was from thence that he began his famous passage of the Alps.

The narrative of Polybius, though it raises some difficult questions, has conveyed to most modern students and scholars the impression that Hannibal crossed by the pass of the Little St. Bernard. Such high authorities as Arnold, Niebuhr and Mommsen regard the question as settled in its favor.

Fifteen days in all were occupied in the passage. The October of the year 218 B.C. saw the passage of the Alps accomplished, and Hannibal with his army encamped in northern Italy. Thus far he had been successful, but at a tremendous cost. His army was shrunk to a force of 20,000 infantry and 6,000 cavalry — the former being composed of Libyans and Spaniards, in about the proportion of three to two, and the latter being chiefly Numidians, and admirably efficient.

It was now five months since he had set out from New Carthage. His men, of course, sorely needed rest, and this they had for a brief space amid the friendly tribes of Cisalpine Gaul. It was now high time for the Romans to exert themselves. Scipio after quitting Mar-

seilles, whence he had sent on his army into Spain, and hurried back to Italy, and, on reaching Placentia, took command of the Roman army quartered there. He was, indeed, numerically weaker than Hannibal, and was deficient in cavalry. Still he advanced up the Po to meet him, and on the Ticino, somewhere, it would seem, near Verecelli, was fought the first engagement of the Second Punic War. It was a cavalry action, and the inferiority of the Romans in this arm was decisively proved. They were driven back with heavy loss, and Scipio himself was severely wounded, being rescued, it is said, by his son, a lad of seventeen, who subsequently became as famous as Hannibal himself, and had the good fortune to be his conqueror. He has come down to posterity as Scipio Africanus. The defeated general fell back to the walls of Placentia. Trebia, a southern tributary of the Po, was between him and the enemy, and he was soon joined by the other consul, Sempronius. Their united armies numbered not less than 40,000 men. Sempronius was for instantly giving battle; Scipio was still disabled by his wound. Sempronius had his way, and on a bitterly cold December day the Romans plunged into the swollen water of the Trebia in the face of a sleet storm and a cutting wind. They fought well, but when taken in flank by Hannibal's brother Mago, who was lying in ambush amid brambles and bushes in a watercourse, they broke and fled in utter rout.

This decisive victory gave nearly all northern Italy to Hannibal. He let his troops rest during the winter, and added to them a number of Gauls. Early in the spring of 217 B.C. he decided to cross the Apennines and to penetrate into the heart of Italy. The road from Cortona to Perugia skirts the northern shore of Lake Trasimene, and into this road, which is in fact a mountain defile, the Roman column unwarily entered. They were caught in a trap. Hannibal had posted his light troops on the hills on either side, while he himself blocked the outlet near Passignano with the best of his infantry. As soon as the Romans were in the pass they were assailed on all sides, and the battle soon became a mere massacre. The Roman army was destroyed, and Flaminius was among the slain. We might suppose that Hannibal would have now done well to have marched straight on Rome, and this the Romans expected. But he may well have thought that it would be better to wait the chance of insurrection among the Italian communities. So he marched through Umbria, and again crossed the Apennines into Picenum. He then marched southward along the coast into Apulia and encamped at Arpi. Meanwhile the Romans had made the famous Fabius Maximus their dictator. After levying an army of four legions, Fabius marched in pursuit of the enemy, having first effected a junction with the army under Servilius at Rimini.

From the first Fabius had decided on the policy which earned for him the name of the *Cunctator*, the Delayer. He dogged his enemy's steps, but would never risk an engagement. The richest districts of southern Italy were laid waste under his very eyes. But he could not be provoked into any rash movement. Once, indeed, it seemed as if Hannibal was himself entrapped. He had been ravaging Campania, and was on the point of retreating into Samnium, when Fabius posted a force at the head of the pass which afforded the only available means for his retreat. Hannibal is said to have driven a multitude of oxen with lighted fagots on their horns up the hills overhanging the road, so as to give the impression that he and his army were retreating over the heights. Fabius' detachment quitted its position to check the supposed movement, and thus gave Hannibal an opportunity of escaping through the pass. The tact-

tics of Fabius disgusted his men, and when he had to leave them for a time, he found on his return that his master of the horse, Minucius, on the strength of a small success won in his absence, was eager to bring on a general engagement. Fabius gave him a part of the army, with which Minucius ventured on an attack. He was on the brink of destruction, when he was rescued by the dictator's timely interposition. After this Hannibal went into winter quarters at Geronium, in the north of Apulia.

In the spring of the next year, 216 B.C., he moved south and pounced on Cannæ, where Roman supplies were stored up in great abundance. The town is about six miles from the mouth of the Aufidus and about eight from Canosa. The Romans were now again eager to strike a decisive blow. So a vast army was raised by the consuls of the year, Æmilius Paulus and Terentius Varro, numbering 80,000 infantry and 6,000 cavalry. Hannibal's army was probably far inferior numerically. The consuls on arriving in Apulia made Canusium (Canosa) their headquarters. For some few days the armies faced each other on the banks of the Aufidus. There were some preliminary maneuvers and skirmishes, till at last Varro, when it came to his turn to command, determined to fight. Both armies crossed the river, and Hannibal's men were drawn up within a loop which it forms near Cannæ. On either flank he stationed a strong body of his veteran infantry. His other infantry, ranged in the center in a crescent form, was soon driven in by the Roman legions, which had advanced to the attack in very deep formation. Meanwhile Hannibal's cavalry had put the Roman horse to rout, and had fallen on their rear. The Roman columns were now attacked also on either flank by the Carthaginian infantry and cut down without the possibility of resistance. The carnage is said to have been prolonged for eight hours. The Roman army was all but utterly destroyed. The consul Æmilius Paulus, nearly all the officers, and eighty senators, perished in the slaughter. Varro indeed escaped with a few horsemen to Venusia. The remainder were slain or made prisoners. It was at a comparatively small cost to himself that Hannibal won this great victory.

It might well be thought that such a victory would prove decisive, and that it must have been had Hannibal instantly pushed on to Rome. But he had probably good reasons for not doing so. He was, it must be remembered, as much as 200 miles from Rome; he would have had to march through still hostile populations, and by the time he would have arrived, he must have known that the first panic would have abated, and that the notion of carrying the city by a *coup de main* was simply preposterous. What he counted on was the dissolution of the Italian confederacy, and a widespread revolt throughout Italy. Nor was he altogether deceived. The disaster of Cannæ shook the loyalty of the Italian people. Rome was deserted by most of Apulia and Samnium, and almost wholly by the Lucanians and Brutians. She retained indeed some strong fortresses, as Cales, Fregellæ, Casinum, Beneventum, Venusia, and these enabled her armies to maintain their ground. But Capua, in Campania, the richest and most powerful city in Italy after Rome itself, was lost to her. Thither Hannibal made his way from Cannæ, and there he went into winter quarters, which were perhaps too comfortable and luxurious. But the story that his men became utterly demoralized is absurd. They proved in the subsequent years of the war that they could move rapidly and fight bravely. We may indeed well suppose that by this time many of his veteran Spaniards and Africans had been replaced by native Italian soldiers. It is, however, clear that he still had a fine army. It is

true indeed, that after Cannæ his star seems to decline, but the explanation of this is that the Romans again reverted to the steady cautious tactics which they had learnt under Fabius. They too were for the most part well-officered. The ablest of their generals was Marcellus. Yet even he never beat his antagonist in anything like a pitched battle. The Romans after Cannæ made prodigious efforts. They sent three armies into the field, to watch and to check the enemy's movements. They kept themselves in strongly entrenched camps near fortresses which Hannibal had not the means of taking. Some indeed he did capture. At Cumæ, Neapolis, and Nola he was foiled. The two years after Cannæ, 215 and 214 B.C., passed without much being achieved on either side. Hannibal was vaguely hoping for reinforcements from Carthage, and for the aid of Philip, king of Macedon.

Next year, 213 B.C., he gained a considerable success. Tarentum surrendered, and so did Metapontum and Thurii. At Tarentum indeed the Roman garrison still clung to the citadel, and Hannibal could not dislodge it. From Carthage he had received a reinforcement of some elephants and of 4,000 Numidian cavalry, but this did not enable him to resume the offensive with much effect. Meanwhile Capua, besieged by two consular armies, seemed doomed to fall again into Roman hands. One of Hannibal's subalterns, Hanno, was defeated in the attempt to revictual the place. Hannibal himself hurried to its aid, but he could not bring the Romans to a battle, though he did temporarily raise the siege. The year 212 B.C., was one of mingled success and disaster for Rome. Syracuse that year had to surrender to Marcellus, and Carthage seemed to have quite lost Sicily. Here was an important gain for Rome. But in Spain the two brothers Scipios had been cut off by Hasdrubal, who could now cross into Gaul and advance on Italy. And in Italy there had been some serious reverses. It would appear that there were actually six Roman armies in the field against Hannibal. One of these under Fulvius he destroyed in Apulia; another, made up of enfranchised slaves under Gracchus—a proof this of the extremity to which Rome was reduced—he put to rout, Gracchus himself perishing in an ambushade.

By the spring of 211 B.C., the Romans were besieging Capua with three armies. It was clear that the city must fall, unless Hannibal could come to its rescue. He made the attempt, but he could not break the hostile lines so strongly were they entrenched. Then he conceived the idea of drawing them off by menacing Rome itself. Now for the first time he marched through Latium and made it taste all the horrors of war. At last he encamped three miles from Rome on the Anio. But the Romans did not lose their presence of mind, or even relinquish the siege of Capua; they simply recalled Fulvius with one of the armies. There were two legions within the city, and Hannibal probably never meditated a serious assault. He ravaged the country up to the walls, but he did nothing more. Through Samnium he again marched into Apulia and thence into Bruttium, where he unsuccessfully attacked Rhegium and the citadel of Tarentum. Capua meanwhile was forced to surrender. This greatly discouraged Hannibal's Italian allies. Marcellus too had come back from Sicily after his capture of Syracuse. Altogether the year 211 B.C., was a very unpromising one for Hannibal. Next year, 210 B.C., however, he partly recovered lost ground by completely defeating the Roman prætor Cneius Fulvius at Herdonea, the modern Ortona, in Apulia. But he could not follow up this success, and his evident weakness led to the speedy return of Samnium and Lucania to the Roman

confederacy. The following year saw Tarentum slip from his grasp. But he soon had his revenge. Next year the two consuls, Crispinus and Marcellus, were both cut off and slain by the Numidian cavalry in the neighborhood of Venusia. Another disaster soon followed. A Roman army was besieging Locri in the extreme south. It was routed and indeed destroyed by Hannibal. Thus at the close of the year 208 B.C., the struggle was clearly by no means decided.

Rome had been making immense efforts. We hear of her having twenty-three legions under arms, and possibly the total number of her armies may have reached 200,000 men. The patriotic spirit of her citizens was still at the highest. But her finances were in a deplorable plight, and corn had risen to an almost famine price. The country round must have been woefully wasted, and multitudes reduced to beggary. One thing indeed the Romans had had to console them during these trying years. The Latin communities in Etruria and Latium had stood by them with wonderful fidelity. This had been their salvation. Now, in the years 209 and 208 B.C., came signs of discontent and wavering. Of the Latin colonies several declared that they could no longer furnish contingents or contributions. There were rumors too of a disloyal movement in Etruria. Worst of all, there came news in the autumn of 208 B.C. that Hasdrubal had crossed the Pyrenees. By next summer he would have passed the Alps. Should the two brothers unite their forces, Rome's fate, it could hardly be doubted, would be sealed. She was now in far greater jeopardy than she was even after the disastrous day of Cannæ.

The year 207 was thus a very anxious one. Claudius Nero and Marcus Livius were the consuls. The first was to watch Hannibal in Apulia, the other was to encounter Hasdrubal in Cisalpine Gaul. Livius retreated before the new invader, and let him reach Siena in Umbria, to the south of the river Metaurus without opposition. Thence Hasdrubal sent dispatches to his brother, who was at Canusium in Apulia. The plan was that they should join their armies at Narnia on the Flaminian road, between fifty and sixty miles from Rome. Unluckily for the two brothers the dispatches fell into the hands of Nero. His resolution was formed in a moment. Leaving the bulk of his army in its camp, he hurried northward with 7,000 men of his best troops, and after a rapid march of 200 miles he joined Livius. The two generals forced Hasdrubal to a battle. The Carthaginian was defeated and slain. Nero returned with all speed to his army, and informed Hannibal of the defeat and death of his brother by having the head of Hasdrubal flung into his camp. With that sight all hope must have died in Hannibal's heart. The battle of the Metaurus was indeed one of the decisive battles of the world. It decided the Second Punic War. From that time, for four more years, Hannibal could but stand on the defensive in the southernmost corner of the Italian peninsula. But even to the last no Roman general dared to close with him. Never in a single battle, as Polybius says, was he beaten while in Italy. Before quitting the country, he left a memorial of his wonderful achievements. In the temple of Juno on the Lacinian promontory, near Crotana, he inscribed on brazen tablets in Punic and in Greek an account of his expedition and his campaigns. Polybius saw the inscription and doubtless availed himself of it for his history. For fifteen years Hannibal had maintained himself in Italy, ravaging it from end to end, and inflicting upon the Romans according to their own calculation a total loss of 300,000 men. Now all was clearly over. After Nero's victory the Romans could afford to wait the course of events. Scipio had been

victorious in Spain, and early in 204 B.C. he was allowed to cross into Africa. Soon it was clear that he would threaten Carthage more effectively than Hannibal had ever threatened Rome. Hannibal received the order of recall at Crotona, and thence embarked for Africa. He landed at the smaller Leptis, on the coast of Tunis, late in the year 203 B.C., and lingered during the winter at Hadrumetum, the modern Susa. His brothers Hasdrubal and Mago had both fallen, and he was now the last of the "lion's brood." Fugitive as he was, his presence roused the Carthaginian spirit. The people would not hear of peace. Hannibal indeed attempted to negotiate, and had an interview with Scipio, but in vain. When he saw that he must fight, he could not have felt any of his old confidence. He had some good troops, but he was numerically inferior to the enemy. Of his veterans but few remained. The armies at last met at Zama, somewhere near the modern Keff. The battle was obstinately contested, and Hannibal's old soldiers died fighting in their ranks. But he never really had a chance of victory. Many of his men were raw mercenaries, and some of them deserted to the enemy. His army was utterly discomfited, and indeed annihilated. The defeat was not discreditable to him, but it was decisive. With a handful of men he escaped to Hadrumetum, and in the year 202 B.C. the Second Punic or, more properly, the Hannibalian War was at an end.

He was still only in his forty-sixth year. He soon showed that he could be a statesman as well as a soldier. Peace having been concluded, he was appointed chief magistrate of the state. The office had become insignificant, but Hannibal restored its power and authority. The oligarchy, always jealous of him, had even charged him with having betrayed the interests of his country while in Italy, and neglected to take Rome when he might have done so. The dishonesty and incompetence of these men had brought the finances of Carthage into grievous disorder. So effectively did Hannibal reform abuses that the heavy tribute imposed by Rome could be paid by installments without additional and extraordinary taxation. Carthage grew prosperous, and again the Romans trembled. Seven years after the victory of Zama they demanded Hannibal's surrender. They were still in mortal dread of their old enemy. Hannibal did not wish his countrymen to disgrace themselves, and he therefore at once became an exile. First he went to Tyre, the mother-city of Carthage, and thence to Ephesus, where he was honorably received by Antiochus, king of Syria, who was then preparing for war with Rome. Hannibal soon saw that the king's army was no match for the Romans. He advised him to equip a fleet and throw a body of troops on the south of Italy, adding that he would himself take the command. But he could not make much impression on Antiochus, who was a conceited man, quite ignorant of the strength of Rome. The story was told that, pointing to the great army he had assembled at Ephesus, he asked Hannibal if he did not think these were enough for the Romans. Hannibal's reply was, "Yes, enough for the Romans, however greedy they may be." The great army in which Antiochus had trusted was, in 190 B.C., routed by Scipio at Magnesia, near Smyrna. Again Rome demanded the surrender of Hannibal.

The end was now at hand. From the court of Antiochus Hannibal fled to Crete, but he soon went back to Asia, and sought refuge with Prusias, king of Bithynia. Once more the Romans were determined to hunt out the old man, and they sent Flaminius to insist on his surrender. Prusias was but a poor paltry princeling, and he promptly complied. Hannibal did not choose to fall into his enemies' hands. At Libyssa, on the eastern

shore of the Sea of Marmora, he took poison, which, it was said, he had long carried about with him in a ring. The precise year of his death was a matter of controversy. If, as Livy seems to imply, it was 183 B.C., he died in the same year as his great and victorious antagonist, Scipio Africanus.

HANNIBAL, a Missouri city, is the principal town of Marion county. It lies on the Mississippi river, 150 miles above St. Louis. It is of importance as a railway center, and the river is crossed here by a large iron railway bridge. The city has a considerable commerce over its various lines, and its banking and telegraph facilities are ample. Its principal commercial interest are centered in lumber, flour, meats, cattle, tobacco, grain, etc. It has car-works, machine shops, foundries and tobacco factories. Its educational and church accommodations are good. Coal mines are in operation in the country contiguous, as are also limestone quarries and lime kilns. Population (1900), 12,780.

HANNO (a very common Carthaginian name), according to the title of the *Periplus* that passes under the name, was a king of the Carthaginians who undertook an exploring and colonizing expedition along the northwestern coasts of Africa beyond the Pillars of Hercules, and on his return inscribed a narrative of his voyage in the temple of Saturn. There are no data to fix with any precision the time at which he flourished.

HANNO, the chief opponent of Hamilcar and Hannibal at Carthage. Few details are known of his life; his influence on the history of his country, which for more than forty years was very great, can be appreciated only from a detailed history of the period. During the first Punic war he conducted successfully a campaign against some African nation, and he soon became the most trusted leader of the aristocratic party. When in 240 B.C. Hamilcar's veterans returned from Sicily, clamoring for their promised pay, Hanno was sent to require them to accept partial payment; and on their rebellion he was appointed to the command against them. His unpopularity with the army, and his incapacity, led to several defeats, and the government was reluctantly forced to associate Hamilcar with him. After Hamilcar had at length crushed the rebellion, Hanno seems to have remained at Carthage exerting all his influence against the democratic party. During the Second Punic war he advocated peace with Rome; and he even, according to Livy (xxiii. 13), advised that Hannibal should be given up to the Romans. After the battle of Zama (203 B.C.) he was one of the ambassadors sent to Scipio to sue for peace, and after the war he is mentioned among the leaders of the Roman party.

HANOVER (German, *Hannover*), formerly an independent kingdom, but since 1866 a province of Prussia, is bounded on the north by the North Sea, northeast by Holstein, Hamburg, and Mecklenburg, east and southeast by Prussian Saxony and the duchy of Brunswick, southwest by Hesse Cassel and Westphalia, and west by Holland. These boundaries include the grand-duchy of Oldenburg, which stretches southward from the North Sea nearly to the southern boundary of Hanover. A small portion of the province in the south is separated from Hanover proper by the interposition of a part of Brunswick. The area of the province extends to 14,548 square miles.

The greater part of Hanover is embraced in that extensive plain which, commencing on the shores of the North Sea, terminates on the frontiers of Russia. The most fruitful districts are the banks of the Elbe and near the North Sea, where, as in Holland, rich meadows are preserved from being immersed in water by

broad dykes and deep ditches, constructed and kept in repair at great expense. It is only the southern portion that is mountainous; the district of Klausthal, containing the Harz, is wholly so, as well as some parts near Göttingen, and in the district of Hildesheim. The Harz mountains are not a part of any chain, but rise from a plain in an isolated group, the highest points of which are nearly in the center (see HARZ). They are covered with extensive forests. On the lower slopes the trees are of the deciduous kinds, but pines alone are found on the summits.

The whole of Hanover dips toward the north; and the rivers consequently flow in that direction. The Elbe, which forms the boundary on the northeast, receives the following tributaries:—the Ohre, which rises in the district of Lüneburg; the Aland and the Jetze, which come out of the province of Saxony, and are navigable in their lower course; the Ilmenau, which becomes navigable at Lüneburg; the Este, navigable to Buxtehude; the Lühne, navigable to Hornburg; the Schwinge, by which vessels reach Stade; the Oste, navigable to Kirchosters; and the Medem, which runs through the Hadeln-land, and admits large vessels up to Otterndorf. The Weser enters Hanover at Münden, being there formed by the junction of the Fulda and the Werra. It is navigable for barges from the spot at which the name commences; and it receives the Hamel, the Aller, the Oertze, the Leine, the Bohme, the Eyther, the Wümme, which in the lower part of its course takes the name of Lesum, the Geeste, and the Hunte,—all of them purely Hanoverian rivers. The Ems rises in the province of Westphalia, and after entering Hanover receives the waters of the Aa, the Haase, the Else, and the Leda, it falls into the Dollart near Emden; which is the principal seaport in the kingdom. It is navigable for flat-bottomed vessels from Rhena downward, and for sea-going vessels from Halte and Weener. The Vecht, a river of short course, rises in the province of Westphalia, and falls into the Zuyder Zee. A navigable canal from the Vecht to Münster connects that city with the Zuyder Zee. Navigable canals connect the various river systems.

The principal lakes are the Steinhuder Meer, about four miles long and two broad, and twenty fathoms deep on the borders of Schaumburg-Lippe; the Dümmersee on the borders of Oldenburg, about twelve miles in circuit; the lake of Bederkesa, and some others in the moorlands of the north; the Seeburger See near Duderstadt; and the Oderteich, in the Harz, 2,100 feet above the level of the sea.

The climate in the low-lying districts near the coast is moist and foggy, in the plains mild, on the Harz mountains severe and variable.

Though agriculture constitutes the most important branch of industry in the province, it is still in a very backward state. The greater part of the soil is of inferior quality, and much that is susceptible of cultivation is still lying waste.

Minerals occur in great variety and abundance. The Harz mountains are rich in silver, lead, iron, and copper; coal is found around Osnabrück, on the Dneister, at Osterwald, etc., lignite in various places; salt springs of great richness exist at Egestorffshall and Neuhaile, near Hanover, and at Lüneburg; and petroleum may be obtained south of Celle. In the cold regions of the northern lowlands, peat occurs in beds of immense thickness.

Works for the manufacture of iron, copper, brass, wire, silver, lead, vitriol, and sulphur are carried on to a large extent. About 40,000 persons are employed in these works and in the mines, the yearly revenue from which amounts to £1,200,000.

Although the carrying trade of Hanover is to a great

extent absorbed by Hamburg and Bremen, the shipping of the province counts 867 sea-going vessels, the larger vessels all belonging to Geestemünde. Emden is destined to become a very important seaport when the extensive harbor improvements have been completed.

To the German parliament (reichstag) Hanover sends nineteen members; to the Prussian house of assembly (abgeordnetenhaus), thirty-six. The debts of the province, contracted before the occupation by Prussia, amount to £226,622.

By the census of 1900 the population had reached 2,590,939. There are 114 towns, but only nine have a population exceeding 10,000, viz.: Hanover, Osnabrück, Hildesheim, Linden, Harburg, Lüneburg, Celle, Göttingen, and Emden.

Among the educational institutions the university of Göttingen stands first, with an average yearly attendance of 900 students. There are besides eighteen gymnasiums, a progymnasium, nine first-class grammar schools, eleven normal and training schools, a polytechnic school at Hanover, a school of mines and forestry at Klausthal, several naval academies and schools of arts, three asylums for the deaf and dumb, two for the blind, and numerous other charitable institutions.

The word Hanover originally applied only to the city so called. It was gradually, however, extended to the country of which Hanover was the capital; and it was officially recognized as the name of the State when in 1814 the electorate of Lüneburg was made a kingdom.

In ancient times the country formed part of Saxony, which remained independent until the time of Charlemagne; and afterward it was included in the duchy of Saxony. After the extinction of the Billung family, which ruled Saxony for about two centuries, the duchy was granted to Lothair of Supplinburg, who in 1125 was elected emperor. There was a division in 1428, whereby were formed the so-called middle lines of Brunswick and Lüneburg. From 1527 Lüneburg was under the sole government of Duke Ernest the confessor, who was an ardent adherent of Luther, and so persistently labored to promote the Reformation in his country that it has been essentially Protestant ever since. He died in the same year as his friend Luther, 1546; and from him descended the younger lines of Brunswick and Lüneburg, or of Brunswick-Wolfenbüttel and Brunswick-Lüneburg. For in 1634 Duke Frederick Ulrich of Brunswick-Wolfenbüttel suddenly died childless, and his duchy was inherited by Augustus the younger, the descendant of Ernest's eldest son Henry; and Brunswick has remained in the hands of this dynasty till the present day. Meanwhile Lüneburg had been ruled over by William, the younger son of Ernest the Confessor; and when he died in 1592 he left seven sons, of whom four, Ernest, Christian, Augustus the elder, and Frederick, one after the other, became rulers of the land. Frederick, who survived all his brothers, died in 1648, the year in which the Thirty Years' War was brought to a close. In 1679 Ernest Augustus, reigning duke, married Sophia the grand-daughter of James I. of England. Ernest Augustus was an exceedingly ambitious prince, and in order to increase the power of his country introduced in 1682 the law of primogeniture. Afterward, in 1692, in consequence of a vast amount of negotiation and intrigue, he managed to secure for himself and his successors the electoral title. He died in 1698, and was succeeded by his son George Louis, who, having married his cousin Sophia Dorothea, the daughter of George William of Calenberg, finally united the two duchies on the death of the latter prince. In 1714 George Louis, the elector of Lüneburg, ascended the throne of Great Britain as George I. After this time, until the death of William IV., Lüneburg or Hanover

had the same sovereign as Great Britain; and this personal union of the two countries was not without important results for both. George II., as the ally of Frederick the Great in the Seven Years' War, joined the struggle in the capacity both of elector and of king; and while George III. was on the throne there was hardly a phase of the foreign policy of England by which Hanover was not affected. In 1803, when the Hanoverian troops capitulated at Sulingen, the country was invested by a French corps, which it had to maintain at a heavy cost. The Prussians received temporary possession of Hanover from Napoleon in 1806; but in 1807 a part of it was annexed to the kingdom of Westphalia, to which the remaining portion was added in 1810. The people never acquiesced in French predominance, and when the final struggle with Napoleon came they distinguished themselves by the ardor with which they flung themselves into it. At the congress of Vienna in 1815, it was demanded in the name of the elector (King George III.) that the electorate should be recognized as a kingdom; and not only was the demand admitted, but the new kingdom received considerable accessions of territory.

Partly through the influence of the French, partly in consequence of the general progress of ideas, Hanover was now, like many other parts of Germany, penetrated by a desire of freedom; and such had been the sufferings of the people, willingly borne for their sovereign and country, that they felt they had a right to be treated in a conciliatory and generous spirit. Their wishes were, however, disregarded. Count Münster, who virtually ruled the country from London, drew up a constitution which came into force in 1819. It was thoroughly reactionary in tendency, and the more resolutely it was enforced the more completely were the people alienated from the ruling class. Not until 1831, when there were several popular risings of so serious a nature that Count Münster resigned, was it deemed necessary to make important concessions, and even then the constitution which the states assembly prepared was made considerably less liberal by William IV. before he sanctioned it in 1833.

As the law of Hanover prevented a woman from mounting the throne, Ernest Augustus, duke of Cumberland, became king after the death of William IV. in 1837. He proved to be a harsh and narrow-minded despot. In 1837 he arbitrarily abolished the constitution of 1833, and when seven professors of the university of Göttingen protested against the act as unlawful, they were deprived of their chairs, and three of the most distinguished—Gervinus, Jacob Grimm, and Dahlmann—were banished from the country. The people were profoundly stirred, and it was hoped that the confederate diet might be induced to protect their rights, but it declined to interfere. A pitiful imitation of a constitution was granted in 1840, but this only intensified the public indignation, which became so strong that in 1848 the revolutionary movement that swept over Europe seemed about to overthrow King Ernest Augustus and his throne together. By hasty concessions he succeeded in preventing this catastrophe, but no sooner did the agitation begin to abate than he showed a disposition to evade the obligations imposed by the constitution which had been wrung from him. The comparatively liberal ministry which had been appointed in the moment of danger was dismissed in 1850, and probably only the death of the king in 1851 prevented him from engaging in as serious a contest as ever with the progressive forces that surrounded him. In 1849, when the Frankfurt diet failed to establish the unity of Germany, he joined the kings of Prussia and Saxony in forming what was called "the three kings' alliance;" but he soon withdrew

from this connection, and associated himself with the thoroughly conservative policy of Austria. Ernest Augustus was succeeded by the blind son, George V. Personally King George was of an amiable disposition, but he shared his father's extravagant conceptions of royal rights, and at once appointed a ministry whose aim was to get rid of the inconvenient constitution of 1848. The second chamber, however, resisted its designs so energetically that in 1852 the more reactionary ministers had to resign, and in 1853 even the modified cabinet was completely defeated. The king then created a government which advised him to appeal to the confederate diet. This was done, and in 1855 the diet proclaimed the constitution of 1848 to be invalid. The states assembly was dissolved, and a ministry was formed, which boldly restored the nominal constitution of 1840. This government spared no effort to obtain an overpowering majority, but, as it still encountered some resistance in the new parliament, fresh elections were ordered, and in 1857 it had the satisfaction of meeting as pliant a body of deputies as the king himself could wish. The people, however, were not in sympathy with their nominal representatives, and gave many proofs of their discontent with the arbitrary rule to which they were subjected. In 1862, when an attempt was made to impose upon the schools the use of a catechism of the seventeenth century, the popular feeling was so decisively expressed that the king was compelled to dismiss his ministers. The new cabinet, which was rather less extravagant; included Herr Windthorst, who had for a short time had a seat in the government that resigned in 1853, and who has since acquired distinction as leader of the Ultramontane party in the imperial parliament of Germany. King George could not long submit even to a slight modification of his absolutist notions, and in 1865 intrusted Herr von Bismarck, who had done him faithful service in previous administrations, with the task of bringing together a cabinet to his liking.

Meanwhile, however, dangers had arisen in Germany, compared with which the internal troubles of Hanover were of small account. Herr von Bismarck, who now controlled Prussian policy, was devising methods for the realization of his vast schemes; and it became increasingly clear, after the Schleswig-Holstein war, that the minor states of Germany would soon have to accept finally the lead either of Prussia or of Austria. Before the outbreak of that conflict Hanover and Saxony had dispatched troops to Holstein for the purpose of executing the will of the bund. Although the federal army was driven back by Prussia, Hanover seemed for a time to be favorable to her rather than to Austria; but in reality the sympathy of the court was altogether with the latter power. On June 14, 1866, in regard to the decisive question whether the federal army should be mobilized, Hanover voted in the confederate diet with Austria; and by doing so she irrevocably declared on which side she would range herself in the approaching struggle. In consequence of this vote Prussia addressed an ultimatum to Hanover on June 15th, requiring her to maintain unarmed neutrality and to accept the scheme for the reform of the confederation which the Prussian plenipotentiary had submitted to the diet before retiring from it. As Hanover rejected these demands, Prussian troops at once crossed the frontier; and on June 17th they were in possession of the capital. On the 27th a battle was fought at Langensalza, in which the Hanoverians were victorious; but they could make no use of their victory, and were soon compelled to capitulate. At the conclusion of the war, by the treaty of Prague, Hanover, with Hesse, Nassau, and Frankfurt, was annexed to Prussia. King

George addressed from Hietzing, near Vienna, a protest to the European cabinets, but it was disregarded; on October 3, 1866, his dominions were formally taken possession of, and in the following year the population were subjected to the Prussian constitution. In 1878 George V. died at Hietzing, but his son, Ernest Augustus, duke of Cumberland, maintains his right to the crown; and there is still a party in Hanover which expresses itself favorable to his claims. The mass of the population, however, whether originally willing to be annexed to Prussia or not, have submitted to the inevitable, and there is evidence that they are gradually becoming loyal subjects of the Prussian king.

HANOVER, the capital, is situated in the south of the above province, on a sandy but fertile plain on the river Leine, which here receives the Ihme, and is from this point navigable to the Weser. It is thirty-eight miles west-by-north of Brunswick by rail, one hundred and fifty-seven miles west of Berlin, seventy-eight southeast of Bremen, and one hundred and seven south of Hamburg. The Leine flows through the town, having the old town on its right bank, and the Calenberger new town between its left bank and the Ihme. The old town is irregularly built, with narrow streets and old-fashioned houses; while the new town has wide streets, handsome buildings, and beautiful squares. Of the latter, the most remarkable are—the square at the railway terminus, with an equestrian statue of King Ernest Augustus in bronze; the triangular theater square; George Square, with the statue of Schiller; Waterloo Square, with a column ninety-nine feet high, surmounted by Victory, and having inscribed on it the names of 800 Hanoverians who fell at Waterloo. In the gardens near the square an open rotunda has been erected inclosing a marble bust of Leibnitz, and near it a monument of General Alten, commander of the Hanoverian troops at Waterloo. The town has numerous churches; in the chapel of the palace are preserved the relics of saints which Henry the Lion brought from Palestine. The royal palace—built 1636–1640, rebuilt 1837—contains a picture gallery and collection of natural curiosities, and the palace of Ernest Augustus is remarkable for its historic collections, especially the famous Welfen museum. The other principal public buildings are the record office, containing a library of 150,000 volumes; the town-hall, built in the fifteenth century; the theater, the museum, the aquarium, the handsome railway terminus, and the exchange. Hanover has a number of colleges and schools, and is the seat of several learned societies. The town possesses large cotton-mills, iron-foundries, and machine factories, numerous tobacco manufactories, breweries, distilleries, etc. Hanover was the first German town that was lighted with gas. It is the birthplace of Sir William Herschel, the astronomer (1738–1822), of the brothers Schlegel, and of the historian Pertz; and the philosopher Leibnitz died there (1716). Population (1901), 235,666.

HANSARD, LUKE, English printer, whose name is familiar in connection with the parliamentary reports, was born July 5, 1752, and obtained in 1772 a situation as compositor in the office of Mr. Hughs, printer to the House of Commons. In two years' time he was made a partner, and undertook almost the entire conduct of the business, which in 1800 was resigned completely into his hands. The promptitude and accuracy with which Hansard printed parliamentary papers were often of the greatest service to the government—notably on one occasion, when the proof-sheets of the report of the secret committee on the French revolution were submitted to Pitt twenty-four hours after the draft had left his hands. Hansard died in 1828.

HANSEATIC LEAGUE. The word "hansa,"

when we find it first in the Gothic Bible of Ulfila, signifies a military assemblage or troop. From this comes the general sense of union, and especially in the Middle Ages of union for mercantile purposes. A later but less important meaning is that of a tax paid by traders for the right of forming such a union.

The Hansa, the league which ultimately overshadowed all rivals, and usurped the name for itself, was no intentional creation, and we can fix no exact date for its origin. It arose gradually from two elements, the union of German merchants abroad, and the union of German towns at home.

The first impulse to mercantile union came from the dangers of traveling in the early Middle Ages. A common depot, or "factory," became the central point of the union or Hansa, formed by the merchants. The union soon received a corporative constitution. At its head stood the elders, whose chief functions were to administer justice and to represent the society in its relations to the natives of the country. It was by means of these orderly unions that the German merchants obtained their important privileges, chiefly advantages in trade and taxes, from the people among whom they sojourned.

Cologne, the first German town which obtained great importance both at home and abroad, possessed at an early date a guild-hall, and all Germans who wished to trade with England had to join their guild. This soon included merchants from Dortmund, Soest and Münster, in Westphalia; from Utrecht, Stavern and Groningen, in the Netherlands; and from Bremen and Hamburg on the North Sea. But when, at the beginning of the thirteenth century, the rapidly rising town of Lübeck wished to be admitted into the guild, every effort was made to keep her out. The intervention of the emperor Frederick II. was powerless to overcome the dread felt by Cologne toward a possible rival to its supremacy. But this obstacle to the extension of the league was soon overcome. In 1260 a charter of Henry III. assured protection to all German merchants. A few years later Hamburg and Lübeck were allowed to form their own guilds. The Hansa of Cologne, which had long been the only guild, now sinks to the position of a branch Hansa, and has to endure others with equal privileges. Over all the branch Hansas rises the "Hansa Alamannice," first mentioned in 1282.

The league between Lübeck and Hamburg was not the only, and possibly not the first, league, among the German towns. But it gradually absorbed all the others.

In the fourteenth century the Hansa changes from a union of merchants abroad to a league of towns at home. In 1330 mention is first made of the Hansa towns, where before it had been the Hanse merchants. In 1343 the league is first designated as the Hansa by a foreign prince, Magnus of Norway, and thus acquires a diplomatic position as a united state.

The league thus formed would scarcely have held long together or displayed any real federal unity but for the pressure of external dangers. The true function of the Hansa, and especially of the Baltic towns, was to conduct the commerce between the east and west of northern Europe. But the geographical position of the Scandinavian countries enabled them to interpose a bar to this commerce. Thus from an early period the Hansa stood in a position of watchful hostility toward those countries. It was the careful maintenance of this watch over the Baltic which gave Lübeck its position in the league, and which gave the league its political as contrasted with its mercantile character.

During the fifteenth century the Hanse towns were frequently compelled to seek safety in arms. Their constant policy was to break up the union of Calmar. In

1428 they sent a large fleet against Eric, Margaret's successor, who wished to add Schleswig and Holstein to his possessions. The accession of two German princes, Christopher of Bavaria, and Christian I. of Oldenburg, to the Danish crown was due in no slight measure to the exertions of the Hansa. On the whole the league held its own in this century, though not without considerable and increasing difficulty.

But with the sixteenth century the Hansa begins really to decline. The English and Dutch proved formidable rivals for the commercial supremacy in northern Europe. Henry VII. secured in 1489 a treaty from Hans of Denmark, which gave England the right of commerce in the northern seas, and which enabled English merchants to found mercantile establishments in the ports.

Besides these causes of decline, the domestic position of the Hanse towns had altered very much for the worse. While in other countries the power of the feudal nobles had fallen before the rapid rise of the monarchy aided by the sympathy of the commons, in Germany alone the power of the princes had constantly increased, at the expense of both king and people. The reformation and the consequent secularization of church property in northern Germany only served to strengthen the hands of the lay princes. Such a state of things was fatal to the independence of a town league, which had always stood opposed to the lawless independence of the nobles. Gradually most of the towns fell off from the league. Foreign countries triumphed at the fall of their former successful rival. In Elizabeth's reign the Hanse merchants in London lost the privileges which they had held since the time of Henry III.

Religious disturbances and the fearful disasters of the Thirty Years' War completed the work thus begun. The peace of Westphalia restored the form but not the reality of the league. In 1669 the last general assembly was held. Henceforth the name of Hanse towns was kept by Lübeck, Hamburg, and Bremen, but it was to designate their independence, not their union.

HANSEN, PETER ANDREAS (1795-1874), astronomer, was born at Tondern, in the duchy of Schleswig. In 1825 he was selected to succeed Professor Encke as director of the observatory of Seeberg, near Gotha. There he remained for the rest of his life, devoting his talents to the development of the highest branches of mathematical astronomy, with an originality of conception which was acknowledged by the English Royal Astronomical Society on two occasions, by the award of their gold medal for his researches in physical astronomy and his lunar tables. His *Tables de la Lune* appeared in 1857, published at the expense of the British Government; they have been adopted for use in the calculations of the *Nautical Almanac*. Hansen was the author of a large number of miscellaneous astronomical papers, principally relating to the orbits of comets and planets or to perturbational astronomy. In one of these he was the first to point out that Encke's value of the horizontal equatorial solar parallax required to be increased to reconcile the lunar theory with modern observations,—an opinion which was subsequently confirmed by Le Verrier from his planetary researches, and by the observations of Mars and the transit of Venus of 1874. Hansen was a foreign member of the Royal Society, and an associate of the Royal Astronomical Society.

HANSTEDEN, CHRISTOPHER, astronomer and physicist, was born at Christiania, Norway, September 26, 1784. He took in 1812 the prize of the Danish Royal Academy of Science for his reply to a question on the magnetic axes. Appointed lecturer in 1814, he was in 1816 raised to the chair of astronomy and applied

mathematics in the university of Christiania. In 1819 he published his researches on terrestrial magnetism. In 1835-38 his text-books on geometry and mechanics were published. He also contributed various papers to different scientific journals, and superintended the trigonometrical and topographical survey of Norway, begun in 1837. He was a member of the Royal Society of London, the French Institute, the American Academy of Arts and Sciences, and the Academies of Berlin and St. Petersburg. Hansteen died at Christiania, April 15, 1873.

HANUSCH, IGNAZ JOHANN (1812-1869), Bohemian savant and philosopher, was born at Prague on November 28, 1812. At the universities of Prague and Vienna, where he afterward studied, he directed his attention successively to theology and law, and finally, under the influence of Hegel's writings, to philosophy. After temporarily supplying in 1835 the place of Lichtenfels, professor of philosophy at Vienna, he was next year appointed ordinary professor of philosophy at Lemberg, whence he passed in the same capacity to Olmütz in 1847, and two years later to Prague. There he began a successful course of philosophy in the Czech language, but in 1852 was abruptly suspended from teaching, owing to his leanings toward Slavism. In 1860 he was nominated director of the imperial university library at Prague, where he died May 9, 1869.

HANWAY, JONAS (1712-1786), an English traveler and philanthropist, was born at Portsmouth. He is popularly known as the first Englishman to carry an umbrella in his native country; this he persisted in using in spite of all the efforts of the hackney coachmen to hoot or hustle him into conformity.

HAPARANDA, from *Haaparanta*, "Aspen-shore," a small town of Sweden in the district of Tornea, at the northern end of the Gulf of Bothnia.

HAPSBURG, or HABSBURG (Hawkscastle), an old German family which has given sovereigns to Germany, Spain, and Austria, takes its name from the old Swiss castle of Habsburg, situated on the river Aar in the canton of Aargau. The first mention of the countship of Habsburg is in a document of 1099, where the name Werner, count of Habsburg, occurs in connection with the consecration of the monastery of Muri as confirming the grants of the pious foundations made by his ancestors. This Werner of Habsburg was a nephew of Werner, bishop of Strasburg, who built the castle of Habsburg about the year 1020. The succession of the family cannot be traced between this period and the time of the emperor Frederick Barbarossa, but in a document whose date is May 30, 1153, Werner II. and his son Albert the Rich are mentioned as counts of Habsburg. Albert died in 1199, and was succeeded by his son Rudolf the Old, who, as a reward for placing a large sum of money at the disposal of Frederick II., received from him the countship of Aargau. Rudolf left behind him two sons, Albert the Wise and Rudolf II., who shared the possessions between them, and founded respectively the lines of Hapsburg-Hapsburg and Hapsburg-Laufenburg. The Laufenburg line also divided into two branches, the former of which became extinct in 1408 and the latter in 1415. Laufenburg thereupon fell to Austria. Albert the Wise of Hapsburg-Hapsburg was married to the countess of Kyburg, who was descended from the dukes of Zähringen, and related to the emperor Frederick II. From this union there was born on May 1, 1218, Rudolf, the founder of the royal dynasty of Hapsburg. He was elected king of Germany in 1273, and after the defeat and death of Ottocar, king of Bohemia, in 1278, at Marchfeld on the Danube, he annexed to his possessions Austria, Styria, Carinthia and Carniola. On the death of Rudolf in 1291 Adolf,

count of Nassau, was elected his successor to the German crown. The greater part of the original lands of the house were gradually lost by the victories of the Swiss Confederates, who finally in 1474 obtained Aargau, in which the castle of Hapsburg was situated. Philip, son of Maximilian I. and of Donna Juana of Spain, ascended the Spanish throne in May, 1506, and on his death in September of the same year, he was succeeded by Charles I., who was chosen emperor in 1519, and was thenceforth known as Charles V. In 1521 Charles granted his Austrian possessions to Ferdinand I., who became the head of the Austrian dynasty. The Spanish branch became extinct in 1700 with the death of King Charles II., and the male line of the Austrian branch became extinct with the death of the emperor Charles VI. in 1740; but the Austrian house was continued in the female line by Maria Theresa, who by her marriage with Francis of Lotharingia, chosen emperor in 1745, founded the line of Hapsburg-Lotharingia, from which the present imperial dynasty of Austria is descended.

HAPUR, or HAPOOR, an ancient town of India in the Meerut district, Northwestern provinces, lies on the Meerut and Bulandshahr road, eighteen miles south of the former city. Population about 20,000.

HARAN, or CHARRAN, is the name of a fertile district in the north of Mesopotamia (Padan-aram or Aram-naharaim), and also of a town situated some ten miles southeastward of Edessa (Orfa), on the banks of the small river Belik about fifty miles to the north of its junction with the Euphrates.

HARAR, HERER, HURRUR, HARRAR-GAY, or ARARGE, a city of northeastern Africa, in the country of the Gallas, at one time the capital of the province of Hadiyah in the Zayla empire, for a long period a small independent state under an emir of its own, and since 1876 subject to the Egyptian crown.

HARBORS AND DOCKS. All harbors may be classed either as havens for the protection of ships during storms, or as ports suited for commercial purposes. Of the first mentioned class, or those which are called harbors of refuge, some are natural and some artificial.

The designing of harbors constitutes confessedly one of the most difficult branches of civil engineering. In order the better to understand the nature of the difficulties which beset the marine engineer, let us suppose that he is called upon to design works for the accommodation of shipping in a given locality. The questions which immediately press on his attention are: What is the cheapest kind of design that is suitable for the place and sufficient for the class of shipping which has to be accommodated? and what are the smallest sizes of materials and thickness of walls that are admissible in its construction, as on these the cost of the work will materially depend.

Harbors of Refuge and Anchorage Breakwaters consist of one or more breakwaters, so arranged as to form a safe roadstead, which shall be easily accessible to the largest vessels in all states of the weather and tide. A breakwater forms a barrier either complete or partial to the progress of the waves, and is intended for sheltering the anchorage ground under its lee. It is not used for commercial traffic as are piers or quays, and therefore a parapet is not necessarily required for preventing the waves from breaking over the top, although this may be useful as a protection against the wind.

A harbor for commercial purposes is any arrangement of piers or breakwaters, or of both, which incloses and so tranquillizes a sheet of water, that vessels may be moored at the quay walls or wharves which form the inner sides of the piers. Where the coast line lies open to a very heavy sea it is often found necessary to make a double or compound harbor. In such a case the en-

trance to the inner basin is situated within the sheltered area formed by the outer works.

A straight pier generally projects at right angles to the coast line, with a free end at its seaward extremity; and, unless when the wind blows right in upon the shore, a straight pier will always afford some shelter on its lee side.

A quay wall is usually built parallel to the line of shore. It affords no shelter of any kind, and the only advantage which it possesses is that of enabling vessels to load and unload without their having to "beach," or, where the shores are steep, even to take the ground.

The local characteristics which demand consideration are the geological and other physical considerations of the shore; the exposure; the force of the waves due to the exposure; the strength, direction, and range of the tides; the depth of the bay or sea in which the harbor is to be built; the proximity of deep water to the works, or in other words, the slope of the foreshore; and the angle at which the heaviest waves impinge on the coast line and on the works.

Harbors of refuge are distinguished from tidal harbors mainly by the superior depth of water which they possess and the larger area which they inclose. The requisites are—shelter during storms, good holding ground, and easy access for shipping at any time of tide and in all states of the weather. A breakwater, though a passive, is yet a real agent, having true work to do. During storms many thousand tons of water are elevated and maintained above the sea-level; and a breakwater has to stop the onward motion within a given space or else to change the direction of their movement. There are two ways in which this work can be performed. One is by means of a plumb wall to alter the direction of the moving water by causing it to ascend vertically, and then to allow it to descend vertically, by which process the waves are reflected and sent back seaward. Another mode is to arrest the undulations by a sloping wall of length sufficient to allow the mass of elevated water to fall down upon the slope. If, however, the slope is not long enough to enable the waves to destroy themselves, they will, though reduced in height, pursue their original direction and pass over the top of the breakwater. In this case the breakwater does not do its full amount of work, and imperfect shelter is obtained.

Of the first kind of harbor that of Chicago, on Lake Michigan, is probably the best specimen in existence. The scope of the work has enlarged to meet the rapidly increasing demand of the phenomenal commercial growth of the city. We give a brief description of the work:

"The work on the harbor was begun in 1833, and continued intermittently until 1870, when it was decided to extend the original plans, and include a commodious exterior harbor. These plans were again finally modified in 1878, so that the completed harbor will include a sheltered area sixteen feet in depth, covering 270 acres, with communicating slips along the lake front covering 185 acres, making a total of 455 acres; this, in addition to the Chicago river, with which the outer harbor communicates. There is, also, an exterior breakwater, one-third of a mile north of the end of the north pier, so situated as to protect vessels entering the mouth of the river. The length of this outer breakwater will be 5,436 feet, of which 3,136 feet have been completed. The north pier, measuring from the outer end of the Michigan street slip, is 1,600 feet long, and extends 600 feet beyond the easterly breakwater, which latter, beginning at the outer end of the south pier, extends directly south 4,060 feet, and is distant 3,300 feet from the present shore line south of Monroe street.

A channel 800 feet wide intervenes between this and the north end of the southerly breakwater. This latter breakwater continues for a short distance due south, then turns at an angle of 30°, and extends in a south-westerly direction to within about 1,550 feet of the present shore line, and 500 feet from the dock line. This breakwater is 3,950 feet in length. The line of wharves and slips will be ended, and the southern end of the harbor completed, by the magnificent wharf to be built by the Illinois Central Railroad Company at Thirteenth street. It will extend to the government dock line. There is a light-house on the shore end, and a beacon light on the lake end of the north pier, and a beacon light on the south end of the easterly breakwater. The Life Saving Station is at the lake end of the northernmost railroad wharf, directly adjoining the south pier.

"On the inner harbor, the wharfing privileges occasioned much dispute, until 1833, when they were defined, the wharves being sold or leased in perpetuity, on payment of their value, and an annual rental of one barleycorn. In 1857 there were but six miles of dock, while at the present time there are twelve miles of slips and slip-basins, and the twenty-nine miles of river front are mostly docked. It happens not infrequently that more than a thousand vessels winter in this harbor."

Docks are of two kinds, viz., dry or graving docks, and wet or floating docks. The dry or graving dock is a small water-tight chamber, fitted with gates of timber or iron, which are shut against the rising tide after a vessel has entered for the purpose of being repaired. The water below low tide level is pumped out generally by steam power. The wet dock or tide basin is a large water-tight inclosure, usually several acres in extent, which is also fitted with gates which are closed, not, however, during the flowing but the ebbing tide, so that the vessels lying at the quays within the basin may remain constantly afloat and nearly at the same level while being loaded and unloaded.

In order to extend the time during which vessels can enter or leave a wet dock there are two additional works which are often connected with it. These are the entrance-lock and the outer or half-tide basin. The lock is a narrow chamber of just sufficient length and breadth to admit a ship of the greatest length and breadth of beam that is expected to frequent the port. Such a lock can, in absence of the largest class of ships, accommodate simultaneously three or four vessels of smaller tonnage. Locks are sometimes made with double gates, so that when only one vessel of small size has to enter, she is shut up within a compartment of the lock, by which means some of the water is saved which would have been expended had the whole of the chamber been filled. Shortly after the tide has begun to ebb, and when the gates of the wet dock have been shut, in order to prevent the water from falling too low in the dock, a vessel can still enter or leave by means of the lock. She is first passed into the lock from the sea; and, the lower or sea gates being closed, the sluices in the upper or dock gates are opened, which raises the water in the lock chamber to the same level as the water in the dock, when the upper gates are opened to let the vessel pass in. Ships leaving the dock after the tide has begun to fall are passed into the lock chamber, when the upper gates are closed and the sluices in the lower gates are opened, until the water in the lock has fallen to the same level as the tide outside, when the lower gates are opened and the vessel goes out to sea. This system of locking is continued so long as the level of the dock is not so much depressed as to affect the loading or unloading of vessels lying at the quays, or until the tide has ebbed so far as to prevent vessels reaching the lock from the sea.

The tide basin may be described as a lock of very large dimensions capable of receiving at the same time a considerable number of vessels, which continue to run into it from the sea after the dock gates have been finally closed for that tide. Such vessels can run in, so long as they have sufficient water over the sill of the sea gates of the basin, or until the basin itself is filled with ships. The sea gates are then closed, and the sluices in the upper gates are opened till the water in the basin is on a level with the water in the dock. The ships are then passed continuously into the dock, in a string, one after the other. By means of this arrangement the traffic can be carried on to a far greater extent than is possible with a narrow lock, which has to be filled and emptied for each vessel that enters or leaves the harbor.

The peculiar advantages of docks are the following. Vessels can be accommodated in the smallest possible space, are enabled to lie constantly afloat; whereas in tidal harbors, where they take the ground, they are apt to be strained or to have their floors broken. But there are other sources of mischief than this in open harbors, for often, when the tide is ebbing, vessels, unless watched, fall against each other. Then there is the chafing of the vessel's sides against the quays in exposed harbors where there is a run of sea, and the breaking of warps during stormy weather or during land floods, where there is a river.

Among the largest and best-sheltered harbors of the Old World are those of Portsmouth and Plymouth, in England, Milford Haven, in Wales, and Queenstown and Lough Foyle, Ireland. France has the magnificent harbor of Cherbourg, on the improvement and fortification of which many millions have been expended, and that of Marseilles on the south. By Australians the harbor of Sydney is claimed to be one of the finest in the world. Of American sea-board harbors that of New York accommodates an enormous trade. All along the Atlantic sea-board from Halifax, Nova Scotia, to Norfolk Roads, good harborage abounds. Charleston, S. C., Port Royal, Tampa Bay, and the Bay of Mobile furnish safe anchorage for large fleets. On the Pacific coast San Francisco has one of the finest harbors of the world, and Puget Sound abounds in good harbors.

HARBOR GRACE, a port of entry and second town in importance of Newfoundland. Considerable proportion of the trade of Newfoundland centers here. The harbor is large, but unprotected from the sea. The town is the see of a Catholic bishop. It has banks and cable and telegraph connections. Population (1901), 6,466.

HARBURG, a seaport town of Hanover, Prussia, at the head of a circle in the district of Lüneburg, is situated on the left bank of the southern branch of the Elbe opposite Hamburg, which stands on the right bank of the northern branch of that river. Population about 24,000.

HARDENBERG, FRIEDRICH VON, German poet and philosopher, best known as Novalis, was born on his father's estate in the county of Mansfeld, in Prussian Saxony, May 2, 1772. After attending the gymnasium of Eisleben he went as a youth of eighteen to the university of Jena, where he studied philosophy, mathematics, and the natural sciences. There he was treated with great kindness by Schiller, of whom he was a warm admirer. He studied law in Leipsic and Wittenberg, and in 1794 settled for a time in Tennstädt in order to perfect himself in the practical work of the legal profession. He died on March 25, 1801. After his death his writings were issued in two volumes by his friends Ludwig Tieck and Friedrich Schlegel, and were rapidly recognized as important contributions to German liter-

ature. They are for the most part composed of fragments, of which the chief is *Heinrich von Ofterdingen*, an unfinished romance.

HARDENBERG, KARL AUGUST, Prussian statesman, was born at Esselroda in Hanover, May 31, 1750. Having studied at Leipsic and Göttingen, he entered the Hanoverian civil service as chamber counselor in 1770. In 1787 he received the office of president of the board of domains in Brunswick. Frederick William II. was so impressed by Hardenberg's appearance and character that in 1790 he recommended him as a minister to the margrave of Anspach and Baireuth. These principalities being united to Prussia in 1791, Hardenberg was appointed a Prussian cabinet minister, but continued to perform his duties as chief administrator of the new province. In the war with the French republic he acted as minister of war, and in 1795 signed on behalf of Prussia the treaty of peace concluded at Basel. When Frederick William III. mounted the throne in 1797, Hardenberg was nominated the chief of the departments for Magdeburg and Halberstadt, for Westphalia, and for Neuchâtel. At this time the foreign policy of Prussia was determined by Haugwitz, who was on all occasions subservient to Napoleon. When in 1803 Prussian interests seemed to be threatened by the French occupation of Hanover, Haugwitz fell into disrepute, and in the following year his place at the head of the cabinet was taken by Hardenberg. The latter was anxious to maintain peace, but when in 1805 Napoleon's troops marched through Anspach he strongly protested, and entered into a convention with Russia. The victory of the French at Austerlitz, however, made it difficult for Prussia to proceed to hostilities; and on December 15, 1805, Haugwitz signed a convention with Napoleon, whereby in return for Hanover Prussia conceded Anspach, Cleves, and Neuchâtel to the French. Hardenberg then retired, and Haugwitz returned to power. After the battle of Jena Hardenberg undertook the office of foreign minister; but when the treaty of Tilsit was signed he withdrew and watched from a distance the vigorous and enlightened efforts of Stein to restore new life to the fallen and humiliated state. Stein being compelled to retire in 1810, Hardenberg was recognized as the only possible successor of the great minister; and he amply justified the confidence with which he was honored. He steadily prepared for the inevitable struggle with France by carrying out Stein's far-reaching schemes of social and political reorganization. The military system was completely reformed, serfdom was abolished, municipal institutions were fostered, the civil service was thrown open to all classes, and great attention was devoted to the educational needs of every section of the community. In the war of liberation Hardenberg was one of those who did most to stimulate the patriotic enthusiasm not only of the Prussians but of all Germans, and so important were his services that on June 3, 1814, after he had signed the first treaty of Paris, he was raised to the rank of a *fürst* or prince. He accompanied the allied sovereigns to London, was one of the chief plenipotentiaries at the congress of Vienna, and took a leading part in the negotiations which led to the second treaty of Paris. He died at Genoa, November 26, 1822.

HARDERWIJK, a town of the Netherlands, in the province of Guelderland, on the coast of the Zuyder Zee, about twenty-eight miles northeast of Utrecht. Population about 7,000.

HARDICANUTE, **HARTHACNUT**, or **HARDKNUT**, the last of the Danish sovereigns of England, son of Canute, king of England, was born in 1018 or 1019. When Canute died in 1035 Hardicanute was ruler of Denmark, and Swend, the elder reputed son of Canute

by Alfgiva of Northampton, one of his concubines, was ruler of Norway. It is said to have been the wish of his father that Hardicanute should be ruler of both England and Denmark, but his connection with Denmark seems to have been prejudicial to his English interests; and though his claims were supported by Godwine and the West Saxons, the witenagemot which met at Oxford decided that his government should not extend further north than the Thames, and that Harold, Canute's younger son by Alfgiva of Northampton, should reign over the northern provinces, being also in all probability overlord of the whole kingdom. Hardicanute refused, however, to come to England on such conditions, and in 1039 the witan of Wessex deposed him, and chose Harold also for their king. On the death of Harold in 1040, Hardicanute, who was about to invade England, had his hostile intentions disarmed by the message which reached him at Bruges, making him an offer of the crown for which he was preparing to do battle. The witan's choice of him seems to have been spontaneous, and not at all due to the threatening attitude he had assumed; but apparently he had not forgotten the former slight he had received, and his short reign was marked by great oppression and cruelty. He caused the dead body of Harold to be dug up from its place of sepulture at Westminster, and thrown into a marsh, or, according to another account, into the Thames; he exacted so heavy a *danegeld* for the support of his foreign fleet that great discontent was created throughout the kingdom, and in Worcestershire a general uprising took place against the earls sent to collect the tax, upon which he burned the city of Worcester to the ground and devastated the surrounding country; in 1041 he permitted Eadwulf, earl of Northumbria, to be treacherously murdered, after having granted him his full friendship. It would appear that Hardicanute was greatly given to excess in eating and drinking, and while carousing at the marriage feast of one of his thegns he was suddenly seized with an epileptic fit, from which he died a few days afterward, June 8, 1042. He had no children, and though the line of Danish sovereigns might have been continued by Swend, the choice of the kingdom was unanimous for Edward Atheling, son of Ethelred.

HARDING, JAMES DUFFIELD (1798-1863), a landscape painter, was the son of an artist, and took to the same vocation at an early age, although he had originally been destined for the law. He died December 4, 1863.

HARDING, JOHN. See **HARDYNG**.

HARDINGE, HENRY HARDINGE, VISCOUNT, field-marshal and governor-general of India, was born at Wrotham in Kent, March 30, 1785. After passing a short time at Eton college, he entered the army in 1798 as an ensign in the Queen's Rangers, with whom he served in Canada. In the Peninsular War he served for a time on Wellington's staff, and received an appointment as deputy quartermaster-general in the Portuguese army from Marshal Beresford, whose approval and subsequent influence he had won by his gallantry at Corunna in 1809. Hardinge was present at nearly all the battles of the campaign; he was wounded at Vimiera and Vittoria. At Albuera he saved the day for the British. When peace was again broken in 1815 by Napoleon's escape from Elba, Hardinge was appointed commissioner at the Prussian headquarters. He was present at the battle of Ligny, June 16, 1815, where he lost his left hand by a shot. In 1820 and 1826, Sir Henry Hardinge was returned to parliament as a member for Durham; and in 1828 he accepted the office of secretary for war in Wellington's ministry, a post which he also filled in Peel's cabinet in 1841-43.

In 1830 and 1834 he was chief secretary for Ireland. In 1844 he succeeded Lord Ellenborough as governor-general of India, a position which he retained till January, 1848. During his term of office the Sikh War broke out; and the governor-general after the battle of Mudki offered to serve as second in command under Lord Gough. He manifested all his old courage and skill, and at the peace, for his services in the campaign, he was created Viscount Hardinge with a Government pension of £3,000 for three lives; while the East India Company voted him an annuity of £5,000. He returned to England in 1848, and in 1852 succeeded the duke of Wellington as commander-in-chief of the British army. While in this position he had the home management of the Crimean War, which he endeavored to conduct on Wellington's principles — a system not altogether suited to the changed mode of warfare. In 1855 he was promoted to the rank of field-marshal. Viscount Hardinge resigned his office of commander-in-chief in July, 1856, owing to failing health, and died on September 24th of the same year at his house near Tunbridge Wells.

HARDOI, a British district of Oudh, India, under the jurisdiction of the lieutenant-governor of the North-Western Provinces, with an area in 1878 of 2,285.64 square miles. The district is an irregular parallelogram between the Gumti and Ganges; its greatest length from northwest to southeast is seventy-eight miles; and the average breadth is forty-six miles. It is bounded on the north by Shāhjahānpur and Kheri; east by Sītāpur, the Gumti forming the boundary-line; south by Lucknow and Unāo; and west by Farrukhābād, the Ganges marking the boundary. Population estimated at 1,000,000.

HARDOUIN, JEAN, was a classical scholar of the seventeenth century. He was born at Quimper, in Brittany, in 1646, and died at Paris in 1727.

HARDT, HERMANN VON DER, Orientalist, was born at Melle, in Westphalia, in 1660, and died February 28, 1746.

HARDWAR, or **HURDWAR**, an ancient town of India, and place of pilgrimage, in Sahāranpur district, northwestern provinces, situated on the right bank of the Ganges at the foot of the Siwālik hills. Population, 4,800.

HARDY, ALEXANDRE (1560–1631), the most fertile of all dramatic authors, next to Lope de Vega and Calderon, merits a place in dramatic literature on that account and no other. He is said to have written upward of six hundred plays, of which forty-one were printed in his own edition of 1624–28.

HARDYNG, or **HARDING, JOHN**, an English rhyming chronicler of the fifteenth century, was born in 1378 and died about 1466.

HARE, the common name of all the species, excepting the rabbit, of *Leporidae*, a family of rodent mammals, distinguished from the rest of that order by the possession of four incisor teeth in the upper jaw, two in front, which are well developed and longitudinally grooved, and two exceedingly small ones behind. The molars are formed for the mastication of vegetable food, an uneven surface being produced by the presence of transverse enamel plates which are worn down more slowly than the intermediate dentine. The teeth are without permanent roots, and thus the constant waste at the surface is compensated for by continuous growth at the opposite extremity. Hares all possess long ears, and in most species the hind legs are much longer than those in front. They are, without exception, timid, defenseless animals, although during the breeding season two males have been known to fight together for possession of the female until one was killed; while all the species are protectively colored. They form a single

genus (*Lepus*), containing from thirty-five to forty species according as certain forms are regarded as independent species, or merely as geographical varieties. They occur in all the great zoological regions of the world, but are especially characteristic of the northern and temperate areas of both hemispheres.

The common hare (*Lepus timidus*) is a typical example of the family. The ears in this species are longer than the head, and its hind legs are so long in comparison with those in front, that it is only by descending a hill diagonally that it can avoid overbalancing itself. It is found in all parts of Europe except the north of Russia, the Scandinavian peninsula, and Ireland, and is especially abundant in those countries in which it enjoys the protection of game laws. Its fur is usually of a tawny gray color above and white beneath, with the upper surface of the short tail and the tips of the ears black. The color of the fur, however, differs considerably in different latitudes and at different seasons of the year, showing, for example, a tendency to become white during the winter in northern countries, while assuming a reddish-yellow hue in the more genial climate of southern Europe. The hare is a night-feeding animal, remaining during the day on its "form," as the slight depression is called which it makes in the open field, usually among grass. This it leaves at nightfall to seek the fields of young wheat and other cereals whose tender herbage forms its favorite food. It is also fond of gnawing the bark of young trees, and thus often does great damage. In the morning it returns to its form, where it finds considerable protection in the close approach which the color of its fur makes to that of its surroundings; should it thus fail, however, to elude observation it depends for safety on its extraordinary fleetness. On the first alarm of danger it is said to sit erect and to reconnoiter, when it either seeks concealment by clapping close to the ground, or takes to instant flight. In the latter case its great speed, and the cunning endeavors it makes to outwit its canine pursuers, form the chief attractions of coursing. The hare takes readily to the water, where it swims well. Hares are remarkably prolific. They pair when scarcely a year old, and the female brings forth several broods in the year, each consisting of from two to five leverets (from the French *lièvre*), as the young are called. These have their sight at birth, and after being suckled for a month they are able to look after themselves. In Europe this species has never been known to breed in confinement. The hare was well known to the ancient Greeks and Romans.

The American varying hare (*Lepus americanus*) is one of the most widely distributed species of this family, extending, in one or other of its four geographical varieties, from the borders of the Arctic barren grounds southward to New Mexico. It differs from the mountain hare of Europe in its smaller size and relatively smaller ears, but resembles it in the change of color in the fur, especially of the northern varieties, during winter. It is exceedingly abundant on the banks of the Mackenzie river, where it is killed in great numbers by the Hare Indians. A favorite device among the Indians for catching it, according to Darwin, is to walk spirally round and round it, when on its form, especially at midday when the shadow of the hunter is shortest. It has still more implacable enemies, however, in the wolves, gluttons, and lynxes of those regions, of the last of which it is said to form the principal food. The fur of this species is imported into Great Britain, but it is of little value. In the swampy district of the southeastern portion of the United States, the swamp hare (*Lepus aquaticus*) and the marsh hare (*Lepus palustris*) occur. These take readily to the water, and are said to

dive for some distance, their legs being less thickly clothed with hair than are those of the less amphibious species. They feed chiefly on aquatic plants. The "jack-rabbit" of the far west is a species of hare.

HARE, JULIUS CHARLES, theological writer, was born at Valdagno, near Vicenza, in Italy, in 1795. In 1822 he was appointed assistant-tutor at Trinity College, which position he retained for ten years. Hare took priest's orders in 1826; in 1832 he succeeded to the rich family living of Hurstmonceaux in Sussex, where he accumulated a library of some 12,000 volumes, especially rich in German literature. In 1851 he was collated to a prebend in Chichester; and in 1853 he became one of the queen's chaplains. He died in 1855.

HAREBELL, or, as the name is often written, **HAIRBELL**, know as the Blue-bell of Scotland, and witches' thimbles, a well-known perennial wild flower. The harebell has a very slender slightly creeping root-stock, and a wiry, erect stem. The radical leaves, to which the specific name refers, have long stalks, and are roundish or cordate, crenate or serrate; the lower stem leaves are ovate or lanceolate, and the upper ones linear, subsessile, acute and entire, rarely pubescent. The flowers are slightly drooping, arranged in a panicle.

HAREM, or less frequently **HARAM**, the recognized European title of that portion of a polygamist's house which is devoted to the exclusive occupancy of his wives and their attendants, or, by a simple metonymy, for the female portion of his household. The word *harem* is Arabic for anything forbidden or not to be touched. It is generally applied in Moslem law to such things as games of chance, draughts, chess, witchcraft, and portrait taking, which are inconsistent with the religious code, and under the form of *haram* it is well known even to Europeans as designating the sacred inclosure of the principal mosque at Cairo and at Jerusalem. The word *seraglio*, which is not unfrequently employed as equivalent to *harem*, is an Italian modification of the Persian term *serai*, which simply means a palace or large building, as in the familiar compound *caravanserai*. Wherever polygamy is maintained in the midst of a developed social life, the *harem* appears to be an almost inevitable institution. We consequently find it after a more or less rigid type among the Jews, the Babylonians, the Siamese, the ancient Persians, the Peruvians, etc. But it is among the modern Mahometan peoples that it has attained its most perfect development; and the harems of the sultan of Turkey and the shah of Persia may be taken as the most elaborate and best-known specimens of the type.

According to the Koran, the Mussulman is required to satisfy himself with four wives, but the sultan may possess as many as seven. Each of these has her own suite of apartments, her own garden and bath-room, her own body of servants, male and female. They are not called by their names, but distinguished as *Kadin* (or Lady) Number One, *Kadin* Number Two, and so on. The title of *sultana* is bestowed only on the mother, the sister, or the daughter of a sultan; and consequently it is the *kadin* who first gives birth to an heir to the empire who alone can share this distinction. She further obtains the title of *hasseky* or *kasseki*, but this is lost if the child dies. All the female slaves, or as they are called *odalisks* (a European corruption of the word *odalik*, from *oda* a chamber, and *lik* belonging to), are at the absolute disposal of the sultan, and if, in spite of the natural endeavors of the *kadins* to prevent such a contingency, one of them become the mother of her lord and master's first-born, she is advanced to the rank of *sultana hasseky*. It is contrary to etiquette for the sultan to select his own favorites among the *odalisks*;

he is expected to accept the choice made for him by his mother, who bears the title of *validé*, and exercises great influence not only in the affairs of the harem but even in political matters. An old and devoted favorite of the sultan occupies the post of *kehaya chatun*, or lady-superintendent of the harem. A large body of eunuchs, both black and white, are employed as guards and gate-keepers. The white eunuchs, have charge of the outer gates of the seraglio, but they are not allowed to approach the women's departments, and obtain no posts of distinction.

HARIKARI (rather *Hara-kiri*, belly-cut, also called happy despatch), a term applied to the curious Japanese system of official suicide, obsolete since 1868. All military men, and persons holding civil offices under the government, were held bound, when they had been convicted of any offense, to rip themselves up. This they performed by two gashes, in the form of a cross. Japanese duels were carried out in a similar fashion, and he who declined to kill himself was held infamous.

HARFLEUR, the Harfleur of the older historians, a maritime town of France in the department of Seine Inférieure and arrondissement of Havre, about six miles east of Havre on the railway between that city and Rouen. Population, 2,000.

HARGREAVES, JAMES. See **COTTON**.

HARIANA, or **HURREANAH**, a tract of country in the Punjab, India, consisting of a level upland plain, interspersed with patches of sandy soil, and largely overgrown with brushwood.

HÄRING, WILHELM (1797-1871), German novelist, known as Willibald Alexis, was born at Breslau, and served as a volunteer in the campaign of 1815. On his return he studied law for some time at the universities of Berlin and Breslau, but he soon gave up the legal profession and devoted himself to literature.

HARINGTON, SIR JOHN (1561-1612), was the son of Mr. John Harington, and Queen Elizabeth's godson. He studied at Eton and at Christ's College, Cambridge, where he took the degree of M.A., his tutor being Bishop Still, the famous author of *Gammer Burton's Needle*. He came up to London about 1583 and studied law, but Queen Elizabeth seems to have removed him to a place at court. Tradition relates that it was at her command that he undertook the translation of Ariosto's *Orlando Furioso*, a work that saw the light in 1591 and was reprinted in 1607 and 1634. Soon after this first date, Harington retired to the family mansion at Kelston. In 1596 he published, in succession, *The Metamorphosis of Ajax*, *An Apology*, and *Ulysses upon Ajax*, the three forming collectively a very absurd and indecorous work of a Pantagruelistic kind. In 1608 he wrote a personal satire against the bishops, which he read to James I., but which was first published by a Presbyterian printer, as late as 1653, under the title of *A Brief View of the State of the Church*.

HARÍRÍ, Abu Mohammed al Kasim ibn 'Alí Ibn Mohammed ibn 'Othman, surnamed **EL HARÍRÍ**, was born at Bussorah, 1054-55 A.D., and died in 1121 or 1123, being therefore contemporary with the first crusade. His native city was renowned for its school of grammar, a most important science among a people whose every rule of religion and of life depended upon the accurate interpretation of some word or passage of the Koran, or some saying of the prophet. The rival school of Kufa was the only one that approached it in fame or glory, and in all the numerous disputes that took place between the two academies, Bussorah is generally allowed to have had the advantage. His great work is the *Mackámdt*, or "assemblies," in which a series of anecdotes of a very slight character in the career of an imaginary learned vagabond afford the

portunity for the display of vast philological and literary learning.

HARLEQUIN. See **PANTOMINE**.

HARLEY. See **OXFORD, EARL OF**.

HARLINGEN, or **HAARLINGEN**, in Frisian *Harns*, an important trading town and seaport in the province of Friesland in the Netherlands. Population (1901), about 15,000.

HARMODIUS, a beautiful Athenian of the tribe Gephyraei, was the intimate friend of Aristogiton, a citizen of the middle rank. Hipparchus, younger brother of the tyrant Hippias, was also a lover of Harmodius. He tried to attract Harmodius to himself, and failing in the attempt, revenged himself by putting a public affront on his sister at a solemn festival. Thereupon the two friends conspired with a few others to murder both the tyrants during the armed procession at the Panathenaic festival, (514 B.C.) But in a sudden alarm they prematurely attacked and slew Hipparchus alone. Harmodius was cut down on the spot by the guards, and Aristogiton was soon captured and tortured to death.

HARMONIA, wife of Cadmus. The Theban legends (see **CADMUS**) have been so modified and systematized by poets and logographers that we must look to Samothrace with its old religious rites for an explanation of the myth. There Harmonia is said to have been the daughter of Zeus and Electra, while her brother Iasion was the founder of the mystic rites which were celebrated annually on the island. When Cadmus came to Samothrace, and was initiated, he received Harmonia as his wife.

HARMONICA is the technical name for the "musical glasses" with the learned conversation about which the pseudo-ladies from town astonish the simple-minded vicar of Wakefield. An instrument for producing musical sounds by means of drinking glasses touched with the moistened fingers was, however, known 100 years before Goldsmith's novel. It was to this instrument that Benjamin Franklin applied his improvements described in his letter to Father Beccaria of Turin. Instead of fixing the glasses he made them rotate round a spindle set in motion by the player's foot by means of a treadle. The edge of the glasses by the same means passed through a basin of water, the pitch henceforth being determined by the size of the glasses alone. The player touched the brims of the revolving glasses with his finger, his task being further facilitated by the scale of color which Franklin adopted in accordance with the musical gamut. The instrument thus improved became very fashionable in England, and a Miss Davis, a relation of Franklin's, became a celebrated harmonica player, who performed at numerous concerts with great applause. It is interesting to know that the great composer Gluck was a virtuoso on the musical glasses in their earlier form, which he played, according to a contemporary advertisement, at the Haymarket theater, April 23, 1746.

HARMONIC ANALYSIS is the name given by Sir William Thomson and Professor Tait in their treatise on *Natural Philosophy* to a general method of investigating physical questions, the earliest applications of which seem to have been suggested by the study of the vibrations of strings and the analysis of these vibrations into their fundamental tone and its harmonics or overtones.

The motion of a uniform stretched string fixed at both ends is a periodic motion; that is to say, after a certain interval of time, called the fundamental period of the motion, the form of the string and the velocity of every part of it are the same as before, provided that the energy of the motion has not been sensibly dissipated during the period.

There are two distinct methods of investigating the motion of a uniform stretched string. One of these may be called the wave method, and the other the harmonic method. The wave method is founded on the theorem that in a stretched string of infinite length a wave of any form may be propagated in either direction with a certain velocity, V , which we may define as the "velocity of propagation." If a wave of any form traveling in the positive direction meets another traveling in the opposite direction, the form of which is such that the lines joining corresponding points of the two waves are all bisected in a fixed point in the line of the string, then the point of the string corresponding to this point will remain fixed, while the two waves pass in opposite directions.

In the harmonic method, on the other hand, the motion of the string is regarded as compounded of a series of vibratory motions which may be infinite in number, but each of which is perfectly definite in type, and is in fact a particular solution of the problem of the motion of a string with its ends fixed.

HARMONIUM. Perhaps no musical instrument ever became in a few years so widely known and used as the harmonium. The reasons for this may at once be found in the facilities it offers for playing easy music, and, when simply constructed, its comparatively low price, which renders the purchase of a tolerable harmonium possible when the cheapest pianoforte worthy of the name would be unattainable, and the real organ, although of chamber size, quite out of the question. Besides being a convenient makeshift for an organ, the harmonium can also be used in domestic concerted music, to play all or any of the wind band parts of the orchestra; it may even be employed as a substitute for the violin, and in such vicarious uses it is past all question one of the handiest of deputies.

It is true the tone of the harmonium is not in itself beautiful; the prominence in sounds from reeds of certain overtones is irreconcilable with pleasure to the ear unless by convention of habit, and the necessity of tuning according to equal temperament all major thirds too sharp leads through this harmonic peculiarity in the chords to an abnormally disagreeable quality, from which those whose nerves are very sensitive or weak are not unfrequently painfully affected. The American organ, a kind of harmonium of late years much in vogue, owes its popularity to its being less pronounced and reedy in timbre (its softer tone being nearer to that we are familiar with in the church organ), and to its being easier to play for simple domestic use. Yet the real harmonium has more independent character as an instrument, and is capable of higher treatment in performance than the American organ.

Both are known as "free reed" instruments, the musical tones being produced by tongues of brass, technically "vibrators," set in oblong frames; the sides of these they do not quite touch, but pass, when in movement, freely downward—the "beating reeds" used in church organs covering the entire orifice. A reed or vibrator, set in periodic motion by impact of a current of air, produces a corresponding succession of air puffs, the rapidity of which determines the pitch of the musical note. There is an essential difference between the harmonium and the American organ in the direction of this current; in the former the wind apparatus forces the current upward, and in the latter sucks it downward.

The Harmonium has a keyboard of five octaves' compass when complete, from C to C, and a simple action controlling the valves, etc. The necessary pressure of wind is generated by bellows worked by the feet of the performer upon footboards or treadles. The air is thus

forced up the wind-trunks into an air chamber called the wind-chest, the pressure of it being equalized by a reservoir, which receives the excess of wind through an aperture, and permits escape, when above a certain pressure, by a discharge valve or pallet. The aperture admitting air to the reservoir may be closed by a draw-stop named "expression." The character of the instrument is then entirely changed from a mechanical response to the player's touch to an expressive one, rendering what emotion may be communicated from the player by increase or diminution of sound through the greater or less pressure of wind the reeds may be submitted to. The draw-stops bearing the names of the different registers in imitation of the organ, admit, when drawn, the wind from the wind-chest to the corresponding reed compartments, shutting them off when closed.

The American organ acts by wind exhaustion. A vacuum is practically created in the air-chamber by the exhausting power of the footboards, and a current of air thus drawn downward passes through any reeds that are left open, setting them in vibration. This instrument has, therefore, exhaust instead of force bellows. Valves in the board above the air-chamber give communication to reeds, made more slender than those of the harmonium, and more or less bent, while the frames in which they are fixed are also differently shaped, being hollowed rather in spoon fashion. The channels, the resonators above the reeds, are not varied in size or shape as in the harmonium; they exactly correspond with the reeds, and are collectively known as the "tube-board." The swell "fortes" are in front of the openings of these tubes, rails that open or close by the action of the knees upon what may be called knee pedals. The tone of the American organ is softer than that of the harmonium; this is sometimes aided by the use of extra resonators. The blowing being also easier, ladies find it much less fatiguing. To these differences we may attribute its increasing popularity. The expression stop can have little power in the American organ, and is generally absent; the "automatic swell" is a contrivance that comes the nearest to it, though far inferior. By it a swell shutter or rail is kept in constant movement, proportioned to the force of the air current. Another very clever improvement introduced by these makers, who are the originators of the instrument itself, is the "vox humana," a smaller rail or fan, made to revolve rapidly by wind pressure; its rotation, disturbing the air near the reeds, causes interferences of vibration that produce a tremulous effect, not unlike the beatings heard from combined voices, whence this name. This vibrato stop has found general adoption. The arrangement of reed compartments in American organs does not essentially differ from that of the harmoniums; but there are often two keyboards, and then the solo and combination stops are found on the upper manual. The diapason treble register is known as "melodia"—different makers occasionally vary the use of fancy names for other stops. The "subbass," however, an octave of sixteen feet pitch and always apart from the other reeds, is used with great advantage for pedal effects on the manual, the compass of American organs being usually down to F (FF, 5 octaves). In large instruments there are sometimes foot pedals as in an organ, with their own reed boxes of eight and sixteen feet, the lowest note being then CC. Blowing for pedal instruments has to be done by hand, a lever being attached for that purpose.

HARMONY. See **ACOUSTICS** and **MUSIC**.

HARO, said to be the ancient *Castrum Biliun*, a town of Spain, is situated in the province of Logroño, and the bishopric of Calahorra, twelve miles southeast of

Miranda, and fifty-eight miles north of Madrid. Population, about 8,000.

HAROLD I., surnamed Fairhaired (Harald Haarfager), the founder of the old royal dynasty of Norway, succeeded his father, Halfdan the Black, as jarl about the year 863. His ambition to become king is said to have been awakened by the refusal of Gyda, daughter of Eric of Hadaland, to marry him until he had made himself ruler of all Norway, as Gorm had of Denmark, and Eric of Sweden; and he vowed that he would never clip nor comb his hair until he had fully achieved his task. After he had subdued all the jarls, he sent for Gyda and made her one of his wives, and had his hair cut at a feast in Möre by Jarl Rögnwald, who then gave him the name of *Haarfager*. Harold died about the year 933.

HAROLD II., surnamed Greyskin (Harald Graafel), son of Eric Bloodyaxe, succeeded Haco the Good in the government of Norway about the year 960, having bribed his other brothers to be satisfied with reigning as under kings in the other provinces. It would appear that Harold himself was disposed to govern peacefully and well, but his brothers now resolved to take vengeance on the friends of the late King Haco, and murdered among others Jarl Sigurd. They, however, failed of their purpose on Haco, his son, who after for some time resisting their attacks fled to Denmark, where he obtained the assistance of King Harold Bluetooth, with whose help he defeated and slew Harold Greyskin, upon which, under Harold Bluetooth, he became ruler of Norway with the title of jarl, according to some in the year 965, to others in 975.

HAROLD III., surnamed Stern in Council (Harald Haardraade or Hardrada), son of Jarl Sigurd, half-brother of King Olaf the Holy, and descended by his father from Harold I., was one of the most distinguished warriors among the old Norse kings. About the year 1045 he came to an agreement with his relative Swend of Denmark, who had been driven by Magnus into exile in Sweden; but Magnus, having obtained news of the intended joint expedition against him, entered into communication with Harold, and agreed to share with him the government of Norway, each ruling over a separate division. They now turned their united forces against Swend, drove him from Denmark, and completely prostrated his power; but just when he had resolved finally in despair to give up the contest, Magnus about the year 1047 took suddenly ill and died, bequeathing on his death-bed the whole of Norway to Harold and Denmark to Swend. Such a bequest did not, however, coincide with the desires of Harold, and between him and Swend a constant warfare raged for several years, until in 1064 they agreed to a peace by which each retained his dominions according to the old established boundaries. The chief motive of Harold in consenting to this arrangement was probably that he might be free to embark on a purpose of wider ambition, namely, to revive in his own person the old Scandinavian sovereignty of England which ended with the death of Hardicanute. In 1066 he set sail for England with an immense fleet. After touching at Orkney, where he left his wife, he proceeded southward to the Tyne, and was there joined by Tostig and by a contingent of troops from Malcolm of Scotland. Leaving a detachment under his son Olaf to guard the fleet, Harold along with Tostig marched with a great force toward York, and, defeating the Northumbrians with heavy loss at Fulford on September 20th, received the surrender of the city on September 24th. Meanwhile Harold of England, having heard of the Norse invasion, was marching northward from London day and night with an immense army; and passing through York on the day after its surrender, he appeared suddenly before the Norsemen encamped at

Stamfordbridge. The Norsemen fought with stubborn courage and fierce energy, but the battle ended at night-fall in their total overthrow. Tostig was slain and also Harold Hardrada himself.

HAROLD IV., king of Norway, surnamed Gille,—said to be the short form of Gylle Kirst, that is, Servant of Christ,—came about the year 1127 to Norway with his mother, an Irishwoman, and claimed to be recognized as the son of King Magnus Barefoot, and half-brother of the reigning Sigurd. Harold reigned as sole king till 1136, when he was murdered in his sleep by Slembi-diakn, another bastard son of Magnus Barefoot.

HAROLD I., surnamed Harefoot, king of England, illegitimate son of Canute and Alfgiva of Northampton, was on the death of Canute in 1035 chosen by the witan overlord of England and king of the province north of the Thames; and in 1037 he became king of England, when the people of Wessex offered him their crown on Hardicanute's refusal to come to England to accept it. In the beginning of Harold's reign Alfred, son of Ethelred, landed in Wessex, with the purpose, it is said, of asserting his claims to its sovereignty; but, either without the knowledge of Earl Godwine, or with his connivance, he was seized by the agents of Harold and put to death with cruel tortures. Harold also banished Queen Emma from the kingdom. The only other event of importance in his reign are inroads of the Welsh and Scots, which were, however, without effectual results, and in the case of the Scots who laid siege to Durham ended in defeat with heavy loss. Harold died at Oxford, March 10, 1040.

HAROLD II., king of the English, was the second son of Earl Godwine and his Danish wife Gytha, the sister of Earl Ulf. The year of his birth is not actually fixed, but it must have been about 1022. The choice of his name, like that of some others of his brothers and sisters (see GODWINE), witnesses to the influence of his Danish mother. Both he and his elder brother Swegen were appointed to earldoms while still very young, seemingly about 1045. Harold's earldom was that of the East-Angles. In 1046 Swegen, having carried off Eadgifu, abbess of Leominster, and not being allowed to marry her, threw up his earldom in disgust, and his possessions were divided between his brother Harold and his cousin Earl Beorn, the nephew of Gytha. In 1049 Swegen came back and sought the recovery of his lands, which was refused by Harold and Beorn. We next hear of Harold in 1051 as accompanying Godwine when he appeared in arms in Gloucestershire. He shared his father's outlawry and banishment in that year, but he chose a different place of shelter, going with his brother Leofwine to Ireland, while Godwine went to Flanders. In 1052 Harold and Leofwine came back. Harold was now restored to his earldom of the East-Angles, and, on his father's death in 1053, he succeeded him in the greater earldom of the West-Saxons. Harold was now the chief man in the kingdom, and when the older earls Leofric and Siward died, his power increased yet more, and the latter part of Eadward's reign was virtually the reign of Harold.

Of one very important event in Harold's life the date can only be guessed at. At some time or other between William's visit to England in 1051 and Eadward's death at the beginning of 1066, Harold was the guest of Duke William in Normandy, and took some kind of oath to him. This oath the Normans represented as an act of homage, with a further oath to procure William's succession to the English crown. The tale is told only by the Norman writers, and it is told by them with such contradictions of every kind that no reliance can be placed on any detail. But that there is some truth in the story is proved by the strongest negative evidence.

While the contemporary English writers take care, directly or indirectly, to deny all those Norman charges against Harold which were sheer invention, they say not a word as to his alleged oath to William. It seems on the whole most likely that Harold was wrecked on the shore of Ponthieu, imprisoned by its Count, Guy, and released by the interference of William. He then helped William in a war with the Bretons, and promised to marry one of his daughters. This was most likely accompanied by an act of homage, such as was often made to any superior or benefactor. Such an oath might, in the ideas of the times, be made to mean a great deal or very little, according to circumstances.

At the beginning of 1066 Eadward died. His last act was to recommend Harold for election to the crown. He was accordingly chosen on the day of Eadward's death, January 5th, and crowned the next day by Ealdred, archbishop of York. But, though he was crowned by the Northumbrian primate, the men of Northumberland at first refused to acknowledge him. They were won over by the new king, who went to York, accompanied by Saint Wulfstan, bishop of Worcester. To secure Eadwine and Morkere, he married their sister Ealdgyth, the widow of the Welsh king Gruffydd. He thus put it out of his power to comply with that part of his engagement to William which is best attested, namely, to marry one of William's daughters. The rest of Harold's reign was taken up with preparations against the attacks of two enemies at once. William challenged the crown, alleging both a bequest of Eadward in his favor and the personal engagement which Harold had contracted toward him. This was of course a mere matter of form, and William began to make ready for the invasion of England. Meanwhile the banished Tostig was trying all means to bring about his own restoration. He first, seemingly in concert with William, came in May, and attacked first the Isle of Wight and then Lindesey, but was driven to take shelter in Scotland. From May to September the king kept the coasts with a great force by sea and land; but at last provisions failed, and the land army was dispersed. Harold then went to London, ready to meet whichever enemy came first. By this time Tostig had engaged Harold Hardrada of Norway to invade England. He accordingly sailed up the Humber, defeated Eadwine and Morkere (September 20th), and received the submission of York (September 24th). Harold of England was now on his march northward; on September 25th he came on the Northmen at Stamfordbridge beyond York, and won a complete victory, in which Tostig and Harold Hardrada were slain. But two days later (September 27th) William of Normandy landed at Pevensey and (September 29th) occupied Hastings, and laid waste the land. Harold had then to march southward as fast as possible. He gathered his army in London from all southern and eastern England, but Eadwine and Morkere kept back the forces of the north. The king then marched into Sussex, occupied the hill of Senlac, now Battle, and awaited the Norman attack. After a vain exchange of messages, the decisive battle was fought on October 14th. As the English were wholly infantry, while the Normans were strongest in cavalry and archers, Harold's object was simply to hold the hill against all attack. As long as he was obeyed, his tactics were completely successful. But a part of his troops, disobeying his orders, left the hill to pursue, and the English array was broken. The Normans could now get up the hill, and, after a fight which lasted from morning till evening, they had the victory. The king and his brothers Gyrth and Leofwine were killed. As Harold was condemned by the pope, William at first refused him Christian burial, and caused him to be

buried on the rocks at Hastings. But it seems most likely that he afterward allowed the body to be removed to Harold's own church at Waltham. The tale which represents Harold as escaping from the battle, living a life of penitence, and at last dying at Chester, is a mere romance.

HAROUN AL RASCHID, more properly Harún er Rashid, "Aaron the Orthodox," was the fifth of the 'Abbasid caliphs of Bagdad. He was born at Ray, March 20, 763 A.D., according to some accounts, and according to others February 15, 766 A.D. Haroun al Raschid was twenty-two years old when he ascended the throne. His biographers unanimously speak of him as "the most accomplished, eloquent, and generous of the caliphs;" but though his name is a household word, and few figures stand out more grandly prominent in the history of their times, little is really popularly known about his private life and personal history.

Raschid owed his own succession to the throne entirely to the prudence and sagacity of Yahya, his secretary, whom, on his accession, he appointed his lieutenant and grand vizier. Yahya, upon whom the whole responsibility of the government really devolved, performed his duties with the most consummate ability and judgment. He fortified the frontiers, and repaired all the deficiencies in the administration of the empire. He filled the treasury, made the provinces flourishing and prosperous by encouraging trade and securing the public safety, and in a word brought the caliphate up to the highest pitch of prosperity and glory.

In 182 A.H. (798 A.D.) Al Raschid proclaimed his son 'Abdallah as his heir apparent after El Amín, his eldest son, whom he had appointed his successor when only five years old, and gave him the post of viceroy of Khorassan. It was on this occasion that he gave 'Abdallah the name of El Mamún and confided him to the care of Jaafer, son of Yahya.

Yahya, the prime minister, and Jaafer, his son, enjoyed so fully the confidence of Haroun al Raschid that they rapidly rose to wealth and power. The great popularity and influence of the Barmek or Barmecide family, however, at length aroused the caliph's jealousy, and to make matters worse he heard that Jaafer had secretly married his sister. No sooner had he been made acquainted with the facts than he caused his sister to be put to death, ordered Mesrúr, his slave and executioner, to bring him Jaafer's head, and next murdered his two inoffending young nephews.

After the fall of the Barmek family the office of prime minister was exercised by Fadhl ibn Rabi, who had been chamberlain to Haroun himself, and to his predecessors Mensúr, Mehdi, and Hádi. He held the office of vizier until the death of Haroun al Raschid, which occurred at Tus, 909 A.D.

The reign of Al Raschid was one of the most brilliant in the annals of the caliphate, and the limits of the empire were then more widely extended than at any other period. The greater part of the Eastern world submitted to his laws, and paid tribute into his treasury; Egypt itself was only a province under his sway, and its ruler an officer appointed by himself. No caliph ever gathered round him so great a number of learned men, poets, jurists, grammarians, cadis, scribes, to say nothing of the wits and musicians who enjoyed his patronage. Haroun himself was an accomplished scholar and an excellent poet.

Haroun al Raschid is best known to Western readers as the hero of many of the stories in the *Arabian Nights*; and in Arabic literature he is the central figure of numberless anecdotes and humorous stories. Of his incognito walks through Bagdad, however, the authentic histories say nothing; and the account of his

relations with Charlemagne, of which European historians speak, does not rest on a trustworthy basis.

HARP, a musical instrument of the string kind, approximating to triangular form from the strings diminishing in length as they ascend in pitch. While the instrument is of great antiquity, it is yet from northern Europe that the modern harp and its name are derived. The Greeks and Romans preferred to it the lyre in its different varieties, and a Latin writer, Fortunatus, describes it in the seventh century of our era as an instrument of the barbarians. This is believed to be the earliest mention of the name, which is clearly Teutonic—the Old High German "harapha," the Anglo-Saxon "hearpe," the Old Norse "harpa." For the origin of the instrument we have to look to Egypt, and the earliest delineations of it there give no indication that it had not existed long before. There are, indeed, representations in Egyptian paintings of stringed instruments of a bow-form that support the idea of the invention of the harp from the tense string of the warrior's or hunter's bow. This primitive-looking instrument was played horizontally, being borne upon the performer's shoulder. Between it and the grand vertical harps in the frescos of the time of Rameses III., more than 3,000 years old, paintings discovered by the traveler Bruce, there are varieties that permit us to bind the whole, from the simplest bow-form to the almost triangular harp, into one family.

The ancient Assyrians had harps like those of Egypt in being without a front pillar, but differing from them in having the sound-body uppermost, in which we find the early use of soundholes; while the lower portion was a bar to which the strings were tied, and by means of which the tuning was apparently effected. What the Hebrew harp was, whether it followed the Egyptian or the Assyrian, we do not know. That King David played upon the harp, as commonly depicted, is rather a modern idea. Mediæval artists frequently gave King David the psaltery, a horizontal stringed instrument from which has gradually developed the modern piano.

The earliest records that we possess of the Celtic race, whether Gaelic or Cymric, give the harp a prominent place, and harpists peculiar veneration and distinction. The names for the harp are, however, quite different from the Teutonic.

Turning to the modern harp, the first pattern of it is discovered in German and Anglo-Saxon illuminated MSS. as far back as the ninth century. A diatonic instrument, it must have been common throughout Europe, as Orcagna, Fra Angelico, and other famous Italian painters depict it over and over again in their masterpieces. No accidental semitones were possible with this instrument, unless the strings were shortened by the player's finger. This lasted until the seventeenth century, when a Tyrolese maker adopted hooks (perhaps suggested by the fretted or bonded clavichord) that, screwed into the neck, could be turned downward to fix the desired semitone at pleasure. At last, somewhere about 1720, Hochbrucker, a Bavarian, invented pedals that, acting through the pedestal of the instrument, governed by mechanism the stopping, and thus left the player's hands free, an indisputable advantage; and it became possible at once to play in no less than eight major scales. By a sequence of improvements, in which two Frenchmen, named Cousineau, took an important part, the various defects inherent in Hochbrucker's plan became ameliorated. The pedals were doubled, and, the tuning of the instrument being changed from the key of E flat to C flat, it became possible to play in fifteen keys, thus exceeding the power of the keyboard instruments, over which the harp has another advan-

tage in the simplicity of the fingering, which is the same for every key.

It is to Sebastian Erard we owe the perfecting of the pedal harp, a triumph he gained in Paris by unremitting studies, begun when he adopted a "fork" mechanism in 1786, and ended in 1810, when he had attained complete success. The mechanical perfection of Erard's apparatus must be seen to be appreciated. *Notwithstanding these improvements, and the great beauty of tone the harp possesses, the domestic use of it has for years past been declining. The great cost of a good harp, and the trouble to many amateurs of tuning, may have led to the supplanting of the harp by the more convenient and useful pianoforte. With this comes naturally a diminution in the number of solo-players on the instrument. Were it not for the increasing use of the harp in the orchestra, the color of its tone having attracted the masters of instrumentation, so that the great scores of Meyerbeer and Gounod, of Berlioz, Liszt, and Wagner are not complete without it, we should perhaps know little more of the harp than the dulcimer, in spite of the efforts of distinguished virtuosi, whose devotion to their instrument maintains its technique on an equality with that of any other, even the most in public favor.

HARPER'S FERRY, a post village of Jefferson county, W. Va., is grandly situated at the foot of Bolivar heights and at the confluence of the Shenandoah and Potomac rivers, where they intersect the Blue Ridge, forty-five miles north-west of Washington. It is the junction-point of the Baltimore and Ohio and the Winchester and Potomac railways; and the Ohio and Chesapeake canal passes along the Maryland side of the Potomac river. The village since the civil war has been in a decaying condition. Previous to the war Harper's Ferry contained an extensive arsenal and armory, and during the war it was the scene of several exploits which have given it a name in history. On October 16, 1859, it was seized by John Brown, the celebrated abolitionist, and a small handful of followers, but as he was unsupported by a rising of the slaves he was overpowered on the morning of the 18th and taken prisoner. On April 18, 1861, it was captured by the Confederates, who on evacuating it in the following June destroyed the arsenal and armory and the bridge across the Potomac. The village was afterward held by a Union garrison of 12,000 men, who, however, on September 15, 1862, after a brave resistance of several days, surrendered to a strong Confederate force under Jackson and A. P. Hill. After the battle of Antietam, on the 17th of the same month, it was reoccupied by the army of the Potomac under General McClellan, who left a strong garrison in the place. In June, 1863, it was again abandoned to the Confederates on their march to Pennsylvania. After their defeat at Gettysburg, the town again fell into the hands of the Federal troops, who held it until the demonstration against Washington in July, 1864. After the battle of Monocacy on July 9th, it was occupied by the United States forces, and held by them until the end of the war. The most flourishing part of the town was nearly destroyed by a flood in the Shenandoah, October, 1878. Pop. (1900), 896.

HARPIES, or HARPYLÆ, are in Homer merely the embodiment of the rapacious power of violent winds. When a man has disappeared in a sudden and inexplicable fashion, it is said that the Harpies have carried him off. There can be no doubt that the wind was by the primitive Indo-Germanic people considered to be the agent that carried off the souls of the dead to dwell with their fathers in heaven, and that this idea appears in the *Odyssey* in a more fanciful form.

HARPOCRATES, originally an Egyptian deity, was

adopted by the Greeks, and became in later times an object of worship both to Greeks and Romans. In Egypt Harpa-khruti, Horus the child, was one of the forms of Horus, the sun-god, the child of Osiris. Hence Herodotus considers him the same as the Greek Apollo. He was said by the Greeks to have been born with his finger on his lips, and is thus represented in statues. As the god of silence he became a favorite deity among the latter mystic schools of philosophy. Festivals with certain mysterious rites were celebrated in his honor.

HARPY, a large diurnal bird of prey, so named after the mythological monster of the classical poets, an inhabitant of the warmer parts of America from Southern Mexico to Brazil. Though known for more than two centuries, its habits have come very little under the notice of naturalists, and what is said of it by the older writers must be received with some suspicion. A cursory inspection of the bird, its size, and its enormous bill and talons, at once suggest the vast powers of destruction imputed to it, and are enough to account for the stories told of its ravages on mammals—sloths, fawns, peccaries, and spider-monkeys. It has even been asserted to attack the human race. How much of this is fabulous there seem no means at present of determining, but some of the statements are made by veracious travelers—D'Orbigny and Tschudi. It is not uncommon in the forests of the isthmus of Panama, and Mr. Salvin says that its flight is slow and heavy. Indeed, its Owl-like visage, its short wings and soft plumage, do not indicate a bird of very active habits, but the weapons of offense with which, as above stated, it is armed, show that it must be able to cope with vigorous prey. Its appearance is sufficiently striking—the head and lower parts, except a pectoral band, white, the former adorned with an erectile crest, the upper parts dark gray banded with black, the wings dusky, and the tail barred; but the huge bill and powerful scutellated legs most of all impress the beholder.

HARRIER. See DOG.

HARRIER, or HEN-HARRIER, a name given to certain birds of prey which were formerly very abundant in parts of the British Islands, from their habit of harrying poultry. The first of these names has now become used in a generic sense for all the species ranked under the genus *Circus* of Lacépède, and the second confined to the particular species which is the *Falco cyaneus* of Linnæus and the *Circus cyaneus* of modern ornithologists.

On the wing Harriers have much resemblance to Buzzards, using the same flapping stroke of the pinions, and wheeling or sailing aloft as they fly. But Harriers are not, like Buzzards, arboreal in their habits, and always affect open country, generally, though not invariably, preferring marshy or fenny districts, for snakes and frogs form a great part of their ordinary food. On the ground their carriage is utterly unlike that of a Buzzard, and their long wings and legs render it easy to distinguish the two groups when taken in the hand. Harriers are found almost all over the world, and fifteen species are recognized by Mr. Sharpe.

HARRINGTON, JAMES, a distinguished writer on the philosophy of government, was sprung from an old family in Rutlandshire, and was born in 1611. He received a careful education, and in his eighteenth year entered Trinity college, Oxford, as a gentleman commoner. One of his tutors was the famous Chillingworth. At the close of his university career he set out to travel on the Continent, and proceeded first to Holland, where he spent several years. He served some time in the Dutch army, and enjoyed the friendship both of the prince of Orange and of the queen of Bohemia. After visiting France and Italy, he returned

to England and lived in retirement till 1646, when he was named one of the grooms of the bed-chamber to Charles I., who was at that time being conveyed south from Newcastle as prisoner of the parliament.

After Harrington's death, Harrington once more withdrew into private life and devoted his time to the composition of his work on the theory of the state, afterward published under the title of *Oceana*. By order of Cromwell the *Oceana* was seized when passing through the press. Harrington, however, managed to secure the favor of the Protector's favorite daughter, Mrs. Claypole; the work was restored to him, and appeared in 1656, dedicated to Cromwell. The views embodied in *Oceana*, particularly that bearing on vote by ballot and rotation of magistrates and legislators, Harrington and others who formed a club called the "Rota" endeavored to push practically, but with no success. In December, 1661, by order of Charles II., Harrington was arrested on a charge of conspiracy, and was thrown into prison. Despite his repeated request no public trial could be obtained, and when at length he endeavored to protect himself by claiming the right of *habeas corpus*, he was secretly removed to a small island off Plymouth. There his health completely gave way, and his mind appeared to be affected. By careful treatment he was restored to bodily vigor, but it is supposed that his mind never recovered its tone. He died September 11, 1677.

HARRINGTON, SIR JOHN. See **HARINGTON**.

HARRIOT, or HARRIOTT, THOMAS, an English mathematician and astronomer, was born at Oxford in 1560. After studying at St. Mary's hall, Oxford, where he took his bachelor's degree in 1579, he became tutor to Sir Walter Raleigh, who in 1585 appointed him to the office of geographer to the second expedition to Virginia. Harriot published an account of this expedition in 1588, and the work was afterward reprinted in Hakluyt's *Voyages*. On his return to England after an absence of two years, he resumed his mathematical studies with zeal and success. He died at London, July 2, 1621.

HARRIS, JAMES (1709-1780), a distinguished English writer on the subject of grammar, was born at Salisbury, on July 20, 1709. In 1751 appeared the work by which he is best known, *Hermes*, a philosophical inquiry concerning universal grammar. The *Philological Inquiries* is a pleasantly written but slight work on the principles of literary criticism and style. It is the least pedantic of all his works. Harris died in December, 1780.

HARRIS, JOHN, D.D. (1667-1719), an English writer, best known as the editor of the *Lexicon Technicum*, which ranks as the earliest of the long line of English encyclopedias, and as the compiler of the *Collection of Voyages and Travels* which passes under his name.

HARRIS, JOHN, divine and theologian, was born at Ugborough, in Devonshire, March 8, 1802, and died in 1856.

HARRIS, SIR WILLIAM SNOW, a distinguished electrician, was born in Plymouth, April 1, 1791. As early as 1820 he had invented a new method of arranging the lightning conductors of ships; but it was only with great difficulty, and not till nearly thirty years afterward, that his invention was adopted by the government for the royal navy. In 1826 he read a paper before the Royal Society *On the Relative Powers of various Metallic Substances as Conductors of Electricity*, which led to his being elected a member of the society in 1831. Subsequently, in 1834, 1836, and 1839, he read before the society several valuable papers on the elementary laws of electricity, and he also communicated to the Royal Society of Edinburgh various inter-

esting accounts of his experiments and discoveries in the same field of inquiry. In 1835 he received the Copley gold medal from the Royal Society for his papers on the *Laws of Electricity by High Tension*, and in 1839 he was chosen to deliver the Bakerian lecture. His manuals of *Electricity*, *Galvanism* and *Magnetism* contributed to Weale's rudimentary series, were, however, written with great clearness, and passed through several editions. He died January 22, 1867, while having in preparation a *Treatise on Frictional Electricity*, which was published posthumously in the same year, with a memoir of the author by Charles Tomlinson, F.R.S.

HARRISBURG, a flourishing city, capital of Dauphin county and of the State of Pennsylvania, is beautifully situated on the east bank of the Susquehanna river, on the Pennsylvania canal, and at the junction of several railways, 126 miles by rail north of Washington and 105 west-by-north of Philadelphia. The river, which is here a mile in width, is crossed by two bridges, one of which is for the use of the railways. Two other bridges of great beauty and strength span the river near the site of the State-house. The State buildings, dating from 1819, occupy an eminence in the center of the busiest portion of the city, and consist of the State capitol, 180 feet long by 80 feet wide, with a circular portico in front supported by six Ionic columns and surmounted by a dome, and, on two sides of the capitol, smaller buildings uniform in design, containing the executive chamber, the State treasury, and various other offices. The capitol park contains a monument to those who died in the Mexican war. Among the other public buildings are the county court-house, the State arsenal, the county prison, and the opera house. Harrisburg is a bishop's see of the Roman Catholic Church. It is well provided with academies and schools, and possesses about thirty churches, several of which are costly and ornamental edifices. It is also the seat of the State library of over 60,000 volumes. Among the benevolent institutions are the city hospital, the home for the friendless, and the State lunatic hospital. An abundant water supply is obtained from the river. Coal and iron are largely wrought in the neighborhood, and the great facilities of communication both by canal and railway have enabled the city to become one of the centers of the iron trade. It possesses large iron foundries, manufacturing of steel, machines, boilers, engines, carriages, nails, files, galvanized iron, brooms, soap, and shoes, rolling mills, saw and planing mills, flour mills, cotton mills, potteries, tanneries, and breweries. Harrisburg received its name from John Harris, an Englishman who settled on the site of the town in 1726, and whose son established a ferry over the Susquehanna in 1753. The town was founded in 1785 under the name of Harrisburg, which was afterward changed to Louisbourg; in 1791 it was incorporated under its present name; in 1812 it became the capital of the State; and in 1860 it was made a city. Population (1900), 50,167.

HARRISON, JOHN, an eminent mechanic, was born at Faulby, in Yorkshire, in 1693. The strong bent of his mind was toward mechanical pursuits; and this showed itself specially in endeavors to improve the construction of clocks and watches so as to render them more accurate measurers of time. He soon learned that, to enable a clock to keep accurate time, the pendulum must be so constructed as to preserve the distance between the point of suspension and center of oscillation invariable, notwithstanding the expansion and contraction of the rod caused by changes of temperature. To accomplish this Harrison devised, in 1726, his ingenious "gridiron pendulum," which consists in having the bob suspended by a series of parallel rods, alternately of steel and brass, so arranged that the downward ex-

pansion of the steel rods from change of temperature is exactly compensated for by the upward expansion of the brass rods. This principle of compensation, modified to suit particular cases, is now applied to all good watches and chronometers. Another ingenious improvement in clockmaking devised by Harrison was his recoil escapement, which obviated the necessity of keeping the pallets well oiled.

In Harrison's time the government of the country had become fully alive to the necessity of determining more accurately the longitude at sea. For this purpose they passed an Act in 1714 offering rewards of £10,000, £15,000, and £20,000 to any who should construct chronometers that would determine the longitude within sixty, forty, and thirty miles respectively. Harrison applied himself vigorously to the task, and in 1735 went to the Board of Longitude with a watch which he also showed to Halley, Graham, and others. Through their influence he was allowed to proceed in a king's ship to Lisbon to test it; and the result was so satisfactory that the commissioners gave him £500 to carry out further improvements. Harrison worked at the subject with the utmost perseverance, and, after making several watches, went up to London in 1761 with one which he considered very perfect. His son William was sent on a voyage to Jamaica to test it; and, on his return to Portsmouth in 1762, the watch was found to have lost only one minute, fifty-four and one-half seconds. This was surprisingly accurate, as it determined the longitude within eighteen miles, and Harrison claimed the full reward of £20,000. After some further trials £10,000 of it was paid to him in 1765, and the remainder in 1767, after he had written such a description of his instrument as would enable other artists to copy it. He died in 1776, at the age of eighty-two.

HARRISON, WILLIAM HENRY, ninth president of the United States, third son of Gov. Benjamin Harrison, was born at Berkeley, Charles City county, Va., February 9, 1773. In 1792 he joined the army with the commission of ensign, and in the following year became lieutenant and acted as aid-de-camp to Wayne in his expedition against the western Indians. He was promoted to a captaincy in 1795, but resigned in 1797 on being appointed Secretary of the Northwest Territory. In 1799 he was chosen to represent that territory in congress, and after its division in 1801 he became governor of the new territory of Indiana, and superintendent of negotiations with the Indians, over whom, on the breaking out of hostilities in 1811, he gained the important victory of Tippecanoe. In 1813 as major-general and commander of the northwestern army he defeated the British forces at the battle of the Thames. In 1814 he concluded a treaty with the northwestern Indians, and in the same year he resigned his commission. He was elected in 1816 member of congress for Cincinnati, in 1819 member of the State Senate of Ohio, in 1824 United States senator, and in 1828 became minister to Colombia, an office which he held for less than a year, when he retired for a time into private life. By the urgent request of the Whigs he was induced in 1836 to stand for the presidency of the United States, and though unsuccessful, he, at the next election in 1840 defeated the same candidate, Van Buren, by an overwhelming majority, after a canvass memorable for the extraordinary enthusiasm it awakened, and historically important for its introduction of new political methods—many of the most characteristic features of Western elections having their origin in this "Harrison campaign." He was scarcely spared, however, to enter upon the discharge of his duties of president, dying April 4, 1841, about a month after his inauguration.

HARRISON, a New Jersey town, in Hudson county, with a population (1890) of 8,338. The place

is sometimes called East Newark, but Harrison is its official designation. It has railroad, banking, telegraph facilities, and several higher educational institutions. Some manufactures exist here, principally trunks, thread, wire, cloth, etc.

HARROGATE, a town and watering-place in the West Riding of Yorkshire, England, is beautifully situated on a fine plateau near the River Nidd, eighteen miles west of York. It is indebted for its rise and importance to its medicinal springs, and is the principal inland watering-place in the north of England. Resident population about 8,000; doubled in the season by visitors.

HARROW-ON-THE-HILL, a village of Middlesex, England, ten miles northwest of London, derives the latter part of its name from its position on a hill which rises from the surrounding plain to the height of about 200 feet. On the summit, and forming a conspicuous landmark, is the church of St. Mary, said to have been founded by Lanfranc, archbishop of Canterbury, in the reign of William I., but of the original building very little is now left. Harrow is chiefly celebrated for its school, founded in 1571 by John Lyon, a yeoman of the neighboring village of Sudbury, who had yearly during his life set aside twenty marks for the education of poor children of Harrow. Though the charter was granted by Queen Elizabeth in 1571, and the statutes drawn up by the founder in 1590, two years before his death; it was not till 1611 that the first building was opened for scholars. Lyon originally settled about two-thirds of his property on the school, leaving the remainder for the maintenance of the highway between London and Harrow, but in the course of time the values of the respective endowments have changed, and while the road commissioners receive about £3,500, the school's share is only about £1,600. In 1660 the headmaster, taking advantage of a concession in Lyon's statutes, began to receive "foreigners," i.e., boys from other parishes, who were to pay for their education. From this time the prosperity of the school may be dated. In 1809 the parishioners of Harrow appealed to the Court of Chancery against the manner in which the school was conducted, but the decision, while it recognized their privileges, confirmed the right of admission to foreigners. At present foundationers receive their education at a slightly cheaper rate than foreigners; there are none who are taught gratis. There is a considerable number of fellowships and scholarships in connection with the school to both the great English universities, some to special colleges, others to colleges in the choice of the holders. The general mode of instruction and discipline is modeled on that of Eton, where most of the former headmasters of Harrow were educated. Originally an exclusively classical school, mathematics became in 1837 a compulsory study at Harrow; modern languages, compulsory on the upper forms only since 1851, were extended to the whole school in 1855; while English history and literature began to be more especially studied about 1860. Science, music, and drawing are now also taught. Among the famous men who have been educated here may be mentioned Bruce, the Abyssinian traveler; Sir William Jones, the Orientalist, Doctor Parr, who was born at Harrow, Admiral Rodney, Sheridan, Byron, Peel, Theodore Hook, Lord Palmerston, Lord Herbert of Lea, the earl of Shaftesbury, and Archbishop Trevelyan.

HARRY, BLIND, or HENRY THE MINSTREL, author of a poem in twelve books, entitled *The Actis and Deidis of the illuster and valteizend campoun, Schir William Wallace, Knight of Ellerslie*. All that is known of Henry's personal history is contained in the following quotation from Major: "Henry, who was blind from

his birth, composed in the time of my youth the whole book of William Wallace, and embodied all the traditions about him in the ordinary measure, in which he was well skilled. By the recitation of these in the presence of the great, he procured, as indeed he deserved, food and clothing."

HARTE-BEEST (*Alcelaphus caama*), a species of antelope, occurring in considerable numbers throughout southern and central Africa. It stands nearly five feet high at the shoulders, and is somewhat ungainly in form, owing to the disproportionate development of its fore and hind quarters—a difference which gives to the posterior limbs, when in motion, an appearance of weakness. The head is long and narrow, and is crowned in both sexes by a pair of nearly cylindrical horns, ringed throughout their lower half, and smooth above. The hair of this species is short, soft, and recumbent, and is of a brownish-yellow color above, and nearly white beneath, the color, however, being to some extent dependent on age and sex, and on the season of the year. The harte-beest is gregarious, living in herds of from five to ten individuals, and frequenting tracts of uninhabited wilderness, or the light brush forest in the neighborhood of rivers. It is exceedingly wary, and consequently difficult of approach, and, when suddenly come upon, the entire herd scampers off in the train of a leader—the herd being rarely seen, when in flight, otherwise than in a string, one treading in the footsteps of another. Of a mild and gentle disposition, the harte-beest seeks safety, whenever it can, in flight; when at bay, however, it does not hesitate to turn upon its pursuers, and to make use of its powerful horns as weapons of offense.

HARTFORD, a Connecticut city, the capital of the State, and the county seat of Hartford county, lies on the Connecticut river, sixty miles from its mouth. It has numerous railway connections, and is in the main a very handsome city. It occupies a hilly site, the surface of which is somewhat uneven and irregular. The streets are straight and usually wide, and contain many handsome buildings. The most prominent public building is the State-house (white marble), situated in Bushnell Park. There are besides many handsome banking and insurance offices. So numerous are the insurance companies, that Hartford is the home *par excellence* of insurance. The new Trinity college is also an exceptionally fine structure. The other noted structures are the State arsenal, the high-school, the new postoffice and the United States court-house. Among the prominent educational establishments, other than those already mentioned, is the Connecticut theological institute. There are several fine libraries in the city, among which may be mentioned the Hartford library, the Wadsworth atheneum, the Watkinson library and the State library. The charities are worthily represented by the State asylum for deaf mutes, orphan asylum, insane asylum and a large hospital. The city has an extensive wholesale and retail trade. It is a great book publishing center and the principal tobacco market of the New England States. Numerous manufactures are carried on here, the principal articles of production being fire-arms of various kinds, machinery all sorts, carriage goods, sash, doors, blinds, etc.

Hartford was first settled in 1633, and it was made the sole capital of the State in 1873. Before this date New Haven had divided this honor with the city. It takes its present name from Hartford in England. It was called New Town by the Dutch, who were its first settlers, but the English occupied it two years later, and in 1637 changed its name to the present one of Hartford. The city charter was obtained in 1784. Since 1830 the population, which was at that time about

7,000, has rapidly increased, and at present (1902) numbers 79,850.

HARTFORD CONVENTION, THE, was an assemblage of delegates from the New England States, at Hartford, Conn., December 15, 1814. It sat twenty days with closed doors, and as it was supposed to be of a treasonable character, it was watched by a military officer. The convention proposed certain amendments to the constitution; but though no treasonable act was committed, and no treasonable intention proved, the Federalist party never recovered from the odium of its opposition to the government, and "Hartford Convention Federalists" was long a term of reproach.

HARTIG, GEORG LUDWIG, a German writer on forestry, was born at Gladenbach near Marburg, September 2, 1764, and died at Berlin February 2, 1836.

HARTLEPOOL, and **WEST HARTLEPOOL**, respectively a municipal borough and a town of England, county of Durham and included in the parliamentary borough of the Hartlepoons, are situated, the one on the north and the other on the south side of Hartlepool Bay, about a mile apart, but having connection by railway, and practically forming portions of one town. By railway Hartlepool is ten miles and West Hartlepool twelve miles north-northeast of Stockton-on-Tees.

HARTLEY, DAVID, who may justly be called the founder of the English Association school of psychologists, was born in 1705. His university career so far modified his theological opinions that, feeling himself no longer able conscientiously to sign the Thirty-nine Articles, he abandoned his intention of studying for the ministry and devoted himself to the study of medicine. He, however, remained in the communion of the English Church, living on intimate terms with the most distinguished churchmen of his day, among whom may be named Joseph Butler, Warburton, Law, Hoadley, and the poet Young. Indeed he asserted it to be a duty to obey ecclesiastical as well as civil authorities. The doctrine to which he most strongly objected was that of eternal punishment. His keen interest in theology is proved by the fact that he devoted a large part of his *Observations* to that subject, the objective side of which he treated upon orthodox lines. The life of Hartley was the useful life of a benevolent and studious physician. He practiced at Newark, Bury St. Edmunds, London, and lastly at Bath, where he died on August 28, 1757. It was at the age of twenty-five that he commenced the series of essays that was to make up his *Observations on Man: his Frame, his Duty, and his Expectations*.

HARTLIB, SAMUEL, was born toward the beginning of the seventeenth century at Elbing in Prussia, his father being a refugee from Poland. His mother was English. About 1628 Hartlib went to England, where he carried on a mercantile agency, and at the same time found leisure to enter with interest into the public questions of the day. In 1641 appeared his *Relation of that which hath been lately attempted to procure Ecclesiastical Peace among Protestants*, and *A Description of Macaria*, containing his ideas of what a model state should be. During the civil war Hartlib occupied himself with the peaceful study of agriculture, printing at his own expense several treatises by others on the subject. In 1650 he issued the *Discourse of Flanders Husbandry* by Sir Richard Weston; and in 1651 his *Legacy, or an Enlargement of the Discourse of Husbandry used in Brabant and Flanders*, by Robert Child.

Hartlib received from Cromwell a pension of £100, afterward increased to £300, as he had spent all his fortune on his experiments. He planned a school for the sons of gentlemen, to be conducted on new prin-

riple, and this probably was the occasion of his friend Milton's *Tractate on Education*, addressed to him in 1644, and of Sir William Petty's *Two Letters* on the same subject, in 1647 and 1648. His own literary labors were mostly confined to prefaces and short essays. The date of his death has been assigned to 1662, as the latest of his extant letters bears that date.

HARTMANN, MORITZ (1821-1872), a German poet and novelist, was born of Jewish parents at Duschnik in Bohemia, October 15, 1821. He studied at Prague and Vienna, and after a tour in Italy, Switzerland, and South Germany became a teacher in Vienna. He left Austria, however, in 1844, in order to publish without danger a volume of patriotic poems entitled *Kelch und Schwert*, which appeared at Leipzig in 1845. After residing for some years in Belgium and France, he went to Leipzig, where in 1847 he published *Neuere Gedichte*. Returning to Austria he suffered a short imprisonment, from which he was freed by the revolution of the following March. In the same year he was chosen to represent the district of Leitmeritz in the Frankfort parliament, where he took his seat on the extreme left. In October he accompanied Blum and Fröbel to Vienna, but he made his escape before the execution of Blum, and took part in the deliberations of the "Rump Parliament" at Stuttgart. In 1849 he published the *Reimchronik des Pfaffen Maurizius*, a satirical political poem in the style of the old chronicles. After the dissolution of the "Rump Parliament," he went to Switzerland, then to England and Ireland, and in 1850 to Paris. After several years' residence at Paris he settled in 1860 at Ghent, where he delivered courses of lectures on German literature and history in some of the principal academies. In 1863 he removed to Stuttgart to edit the *Freya*, and in 1868 he undertook the editorship at Vienna of the *Neut Freie Presse*. He died near Vienna, May 13, 1872.

HARTMANN VON AUE, a Middle High German poet, was born about 1170. He was of knightly rank, and was able to read and write. Among his accomplishments was a knowledge of French. Although his lyrics are not without merit he excels chiefly in narrative poetry; and the best known of his narrative poems, which was also one of the earliest, is *Der arme Heinrich* ("Poor Henry").

HARTSHORN, SPIRITS OF, a name signifying originally the ammoniacal liquor obtained by the distillation of horn shavings, afterward applied to the partially purified similar products of the action of heat on nitrogenous animal matter generally, and now popularly used to designate solution of ammonia. (See AMMONIA).

HARUN ER RASHID. See HAROUN AL RASCHID.

HARUSPICES (literally entrail-observers), a class of soothsayers in Rome. Their art consisted especially in deducing from the appearance presented by the entrails of the slain victim the will of the gods. They also interpreted all portents or unusual phenomena of nature, especially thunder and lightning, and prescribed the expiatory ceremonies after such events.

HARVARD COLLEGE, the earliest institution of learning in the United States and on the continent of North America. The English colonists on Massachusetts Bay, settling at what is now Boston in 1630, began a plantation the next year three miles up the Charles River, which they called "New Towne." The colony court of September, 1636, "agreed to give £400," which exactly doubled the public tax for the year, "towards a schoole or colledge, whereof £200 to be paid the next yeare, and £200 when the work is finished, and the next court to appoint wheare and what building." In November, 1637, "the Colledge is ordered to

be at New Towne," the name of which had been changed to Cambridge, and a committee was appointed "to take order" for it. In March, 1638-39, "it is ordered that the colledge agreed upon formerly to be built at Cambridge shalbee called Harvard Colledge." The reason was that the Rev. John Harvard, B.A. 1632, and M.A. 1635, of Emmanuel College, Cambridge, England, dying in Charlestown, Mass., September 14, 1638, by will left half his estate, about £800, and his library, to the wilderness seminary. The college charter of 1650 declared the object to be "the education of the English and Indian youth of this country in knowledge and godlynes." The first brick edifice on the college grounds, having rooms for twenty of the aborigines, was called "the Indian college." In it was printed the apostle Eliot's translation of the Bible into the language of the natives, with primers, grammars, tracts, etc. Several of the natives were members of the college; only one graduated from it.

Thus from the beginning private munificence rather than the public treasury fostered and sustained the college, and with steadily increasing preponderance all through its history have its supplies and endowments come from the generosity of individuals. Grants from the colony, province, and State, of small sums for salaries and incidental purposes, made annually or at intervals, wholly ceased more than sixty years ago. With scarce an exception all the present invested funds of the college and of its professional schools, amounting to \$13,119,538, with the halls, library, and apparatus, are the benefactions of its friends.

The charter constitutes as a corporation a president, treasurer, and five fellows, who initiate all measures concerning the college, hold its funds, and have the nomination for filling vacancies in their own body, subject, however, to the final action of a board of overseers. The State, claiming as founder and patron, till recently regarded the college as a State institution, over which it should exercise a direct control through the legislature and the executive, by its authority in the membership and the election of the whole or a part of the board of overseers, but the organic connection with the State by this tie was severed by statute in 1866. The board of overseers as now constituted is composed of thirty of the alumni, besides the president and the treasurer, elected by the ballots of the alumni on commencement day at the college, in sections of five, serving a term of six years. With its complement of professional schools of law, medicine, theology, science, and many special departments of the latter, more than any other institution in America, and with but a few gaps yet to be filled in its completeness of method and equipment to bring it to comparison with foreign institutions of learning, Harvard College may claim to be in the most comprehensive sense of the term a university, a title which is, indeed, assumed, and generally applied to it. Recent changes in the course of study in the college have allowed a wide range for elective studies to undergraduates, the proportions being, one-fourth obligatory, three-fourths elective. In the professional schools most of the studies are obligatory. The number of bound volumes in the library and schools is 576,900. The number of halls owned and occupied for college uses is twenty-nine and the number of attending students (1902) is 5,125. The whole number of professors, instructors, etc., in all departments, is 483; of librarians, proctors, and other officers in the service of the college, twenty-eight. The number of the alumni of the college proper is about 24,375; the number living (1902) is 14,026.

HARVEST-BUG, a name erroneously applied to the hexapod larval condition of a mite, not one of the

Psecta, but belonging to the division *Acaridea* of the class *Arachnida*. It is very small, of brick-red color, and swarms both among wild vegetation and cultivated plants, especially near the sea, attaching itself, however, on the first opportunity to the bodies of human beings, hares, dogs, cats, and other mammals, and even insects. On reaching the skin, it rapidly burrows deeply into it, causing a painful itching, followed by a swelling of irritation and size varying with the individuals attacked, and enduring for several days. It is usually at the end of July or in August that these mites make their appearance; and the frequency with which they attach themselves to the lower extremities of people walking in fields at harvest-time has given rise to their trivial name. The effect of their subcutaneous presence varies in different people, as above mentioned; in some it assumes so intensely painful an aspect as to originate a disease called autumnal erythema. Extraction with a fine needle, under a magnifying power, is the best way to get rid of the pests; but the application of a solution of carbolic acid, benzine, sulphur ointment, or any other powerful and easily diffused insecticide agent will usually soon destroy them.

HARVEY, GABRIEL (1545-1630), an English writer of the Elizabethan period, received his education at Christ's College and Pembroke Hall, Cambridge, where we find him about 1576-78 lecturing on rhetoric. Though Harvey expresses a desire to be "epitaphed the Inventor of the English Hexameter," his name, familiar enough to his more learned contemporaries, would probably have been well nigh forgotten had it not been for his friendship with Spenser and his hostilities with Greene and Nash.

HARVEY, SIR GEORGE, a Scottish painter and president of the Royal Scottish Academy, was born near Stirling in 1806. In his eighteenth year he entered the Trustees' Academy at Edinburgh. Here he so distinguished himself that in 1826 he was invited by the Scottish artists, who had resolved to found a Scottish academy, to join it as an associate. Harvey's first picture, *A Village School* was exhibited in 1826 at the Edinburgh Institution; and he continued annually to enrich its exhibitions by a succession of pictures, which appealed with such effect to Scottish sentiment as to win for him in his native land an unrivaled popularity. His best known pictures are those depicting historical episodes in religious history from a puritan or evangelical point of view, such as *Covenanters Preaching*, *Covenanters' Communion*, *John Bunyan and his Blind Daughter*, *Sabbath Evening*, and the *Quitting of the Manse*. He was equally successful in subjects not directly religious; and *The Bowlers*, *A Highland Funeral*, *The Curlers*, *A Schule Skailin'* and *Children Blowing Bubbles in the Churchyard of Greyfriars, Edinburgh*, manifest the same close observation of character, artistic conception, and conscientious elaboration of details. In *The Night Mail* and *Dawn Revealing the New World to Columbus* the aspects of nature are made use of in different ways, but with equal happiness, to lend impressiveness and solemnity to human concerns. In 1829 Harvey was elected a fellow of the Royal Scottish Academy, and in 1864 he succeeded Sir J. W. Gordon as president. He received the honor of knighthood in 1867. His death took place at Edinburgh, January 22, 1876.

HARVEY, WILLIAM, the discoverer of the circulation of the blood, was born at Folkestone in 1578. After passing through the grammar school of Canterbury, he became a pensioner of Caius College, Cambridge; at nineteen he took his B.A. degree, and soon after, having chosen the profession of medicine, he went to study at Padua under Fabricius and Casserius. At the age of twenty-four Harvey became doctor of medicine,

April, 1602. Returning to England in the first year of James I., he settled in London. In the same year Harvey became a candidate of the Royal College of Physicians, and was duly admitted a fellow. In 1609 he obtained the reversion of the post of physician to St. Bartholomew's hospital. On the death of Doctor Wilkinson in the course of the same year he succeeded to the post. He was thrice censor of the college, and in 1615 was appointed Lumleian lecturer. In the following year—the year of Shakespeare's death—he began his course of lectures, and first brought forward his views upon the movements of the heart and blood. In 1618 he was appointed physician extraordinary to James I., and on the next vacancy physician in ordinary to his successor. In 1628, the year of the publication of the *Exercitatio Anatomica de Motu Cordis et Sanguinis*, he was elected treasurer of the College of Physicians. He visited Italy, and returned in 1632. Four years later he accompanied the earl of Arundel on his embassy to the emperor. Having returned to his practice in London at the close of the year 1636, he accompanied Charles I. in one of his journeys to Scotland. While at Edinburgh he visited the Bass Rock; he minutely describes its abundant population of sea-fowl in his treatise *De Generatione*, and incidentally speaks of the then credited account of the solan goose growing on trees as a fable. He was in attendance on the king at the battle of Edgehill (October, 1642). After the indecisive battle, Harvey followed Charles I. to Oxford. There he remained three years, and there was some chance of his being superseded in his office at St. Bartholomew's Hospital, "because he had withdrawn himself from his charge, and is retired to the party in arms against the parliament." It was no doubt at this time that his lodgings at Whitehall were searched, and not only the furniture seized but also invaluable manuscripts and anatomical preparations.

While with the king at Oxford he was made warden of Merton College, but a year later, in 1646, that city surrendered to Fairfax, and Harvey returned to London. He was now sixty-eight years old, and, having resigned his appointments and relinquished the cares of practice, lived in learned retirement with one or other of his brothers. The work on which he had been chiefly engaged at Oxford, and indeed since the publication of his treatise on the circulation in 1628, was an investigation into the recondite but deeply interesting subject of generation. The result was the publication of the *Exercitationes de Generatione* (1651).

This was the last of Harvey's labors. He had now reached his seventy-third year. His theory of the circulation had been opposed and defended, and was now generally accepted by the most eminent anatomists both at home and abroad. He was known and honored throughout Europe, and his own college erected a statue in his honor (1652). In 1654 he was elected to the highest post in his profession, that of president of the college.

Harvey, like his great contemporary and successor Sydenham, was long afflicted with gout, but he preserved his activity of mind to an advanced age. In his eightieth year, on June 3, 1657, he was attacked by paralysis, and died the same evening.

HARWICH, a municipal and parliamentary borough and seaport town of Essex, England, is situated on the extremity of a small peninsula projecting into the estuary of the Stour and Orwell, seventy miles north-east of London. Harwich in all probability occupies the site of a Roman station. In 855 a great naval battle took place opposite the town between the Danes and the fleet of King Alfred, and in 1666 another took place between the Dutch and the English. Harwich

was created a parliamentary borough by King Edward II. in 1318 with the privilege of returning two members, but since the Reform Act of 1867 it has returned only one. Population (1901), about 9,500.

HARZ MOUNTAINS, **THE** (also spelt **HARTZ**, the German *Harzgebirge*, and the ancient *Silva Hercynia*), the most northerly mountain-system of Germany, situated between the rivers Weser and Elbe, occupy an area of about 786 square miles, of which 457 belong to Prussia, 286 to Brunswick, and 43 to Anhalt. Their greatest length extends in a southeast and northwest direction for about fifty-six miles, and their maximum breadth is about twenty miles. The group is made up of an irregular series of terraced plateaus, rising here and there into rounded summits, and intersected in various directions by narrow, deep valleys. The highest summits of the Upper Harz are the Brocken (3,743 feet), the Heinrichshöhe (3,402 feet), the Greater and Less Königsberg (3,376 feet and 3,369 feet), and the Wormberg (3,182 feet); the Lower Harz, the Auersberg (1,870 feet), and the Victorshöhe (1,762 feet). The towns in the district, though not large, are tolerably numerous.

The chief industry is mining, which has been carried on since the middle of the tenth century. The Harz is second only to the Erzgebirge among the mountains of Germany in mineral wealth. The most important mineral is a peculiarly rich argentiferous lead, but gold in small quantities, copper, iron, sulphur, alum, and arsenic are also found. Marble, granite, and gypsum are worked; and large quantities of vitriol are manufactured. The vast forests that cover the mountain slopes supply the materials for a very considerable trade in timber.

The Harz being the first obstacle to oppose the moist, cold winds from the North Sea, the northern summits are destitute of trees, but the lower slopes of the Upper Harz are heavily wooded with pines and firs. Between the forests of these stretch numerous peat-mosses, which contain in their spongy reservoirs the sources of many small streams.

The inhabitants, about 70,000 in number, are descended from various stocks. The Upper and Lower Saxon, the Thuringian, and the Frankish races have all contributed to form the present people, and their respective influences are still to be traced in the varieties of dialect. The boundary line between High and Low German passes through the Harz.

The Harz is now one of the most frequented tourist resorts of Germany. It is traversed by excellent roads in all directions, and is completely girt by railways from the principal towns of the empire. The chief point of interest is undoubtedly the Brocken or Blocksberg, famous as the scene of the "Walpurgisnacht" in Goethe's *Faust*, as well as for the atmospherical phenomena of which the "spectre of the Brocken" (see *HALLO*) is the best known. The Harz was the last stronghold of paganism in Germany, and to that fact are due the weird legends, in which no district is richer, and the wild and fanciful names that are given by the people to the peculiar objects and appearances of nature.

HARZBURG, or **NEUSTADT-HARZBURG**, the chief town in the Brunswick circle of Wolfenbüttel, Prussia, is situated 727 feet above sea-level on the right bank of the Radau. Population about 5,000.

HASAN and **HUSEIN**, the sons of 'Alī ibn Abū Tālib, cousin and son-in-law of Mahomet, and heroes of the passion play performed annually throughout India and Persia by Shīah Mahometans in the month of Moharram.

HASBEYA, or **HASBEIYA**, a town of the Druses,

about thirty-six miles west of **Damascus**, is situated at the foot of Mount Hermon in Syria, overlooking a deep amphitheater, from which a brook flows to the **Hasbāni**. Population about 5,000.

HASDRUBAL. Of the bearers of this very common Carthaginian name the most famous are the following:—

1. One of the leaders of the popular party at the close of the first Punic war. He was conspicuous for his dexterous management in politics and his conciliatory manners. He married the daughter of Hamilcar Barca; and his skillful and cordial coöperation was of enormous consequence to Hamilcar during his Spanish wars. In 221 B.C. he fell by the hand of an assassin.

2. The second son of the great Hamilcar. He was left by Hannibal as commander in Spain (219 B.C.), where he had to contend with the two Scipios, Cneius and Publius. Three years were spent in desultory warfare, in which the Romans were generally successful. After the battle of Cannæ, Hasdrubal was ordered to march into Italy, while Himilco was sent from Carthage with a fresh army to supply his place. But a decisive battle on the Ebro, in which he was totally defeated, checked his northward march. It is hardly possible to exaggerate the importance of this battle. Had a fresh Carthaginian army joined Hannibal in Italy for the campaign of 215 or 214, the danger to Rome would have been infinitely increased. In 207 B.C., Hasdrubal, after a very rapid and skillful march across the whole breadth of Gaul, appeared in the north of Italy. When once he had succeeded in getting out of Spain, this brilliant march proved Hasdrubal worthy of his father and his brother. On hearing of the passage of the Pyrenees, the Romans raised extraordinary levies, but before they had taken any steps to meet him, Hasdrubal was already in Cisalpine Gaul. Hannibal was still in Apulia, perhaps not expecting his brother so soon; Hasdrubal sent to meet him two Numidian horsemen with four Gauls, who almost at the end of their perilous journey fell into the hands of the consul Nero. In the meantime Hasdrubal had advanced into Umbria, where the plebeian consul Livius was encamped near Siena. Nero, with 7,000 men, left his own camp, and by a rapid march, which must be ranked among the most important events of the war, joined his colleague. The united army was much too strong for Hasdrubal. He tried to avoid a battle, but his guides failed him, and he was forced to fight on the south bank of the Metaurus. A long and bloody conflict resulted in the complete defeat of the Carthaginians, and Hasdrubal, after all was lost, fell sword in hand in the midst of the enemy. His head, which was thrown by Nero's soldiers into Hannibal's camp, first revealed to the latter his brother's defeat and the ruin of the Carthaginian cause.

HASLINGDEN, a market town of Lancashire, England, is situated seven miles southeast of Blackburn, in a hilly district on the borders of the forest of Rossendale, and is supposed by some to derive its name from the hazel trees which at one time abounded in its neighbourhood. Population about 14,500.

HASPE, a town of Prussia, province of Westphalia. Population, 9,000.

HASSAN, a district of Mysore, India, bounded on the southwest by the Madras district of South Kanara, and on the south partly by the state of Coorg. The main portion of the district consists of the river basin of the Hemavati and its tributaries. It naturally divides into two portions, the Malnād or hill country, which includes some of the highest ranges of the Western Ghāts, and the Maidān or plain country, sloping toward the south. Area, 3,291 square miles. Population, 750,000.

HASSAN. See ASSASSINS.

HASSE, JOHANN ADOLPH. One of the most prolific and most celebrated composers of the eighteenth century, is now all but forgotten, and his extant works rest quietly on the shelves of public libraries. He was born at Bergedorf, near Hamburg, in 1699, and died in 1783.

HASSELQUIST, FREDERICK, a Swedish traveler and naturalist, was born near Linköping in East Gothland, January 3, 1722, and died in 1752.

HASSELT, a town of Belgium, capital of the province of Limburg, is situated on the Demer and on the railway from Aix-la-Chapelle to Maestricht, twenty miles northwest of Liège. Population, 12,000.

HASSENPFUG, HANS DANIEL LUDWIG FRIEDRICH, a minister of state in Hesse-Cassel, celebrated as a reactionary, was born at Hanau, in the electorate of Hesse, in 1793, and died in 1862.

HASTINAPUR, an ancient city of India, in the Meerut district, Northwestern Provinces, lying on the bank of the Burigangá, or former bed of the Ganges, twenty-two miles northeast of Meerut. It formed the capital of the great Pándava kingdom, celebrated in the *Mahábhárata*, and probably one of the earliest Aryan settlements outside the Punjab.

HASTINGS, a municipal and parliamentary borough and market-town of Sussex, England, the principal of the Cinque Ports, is picturesquely situated on the southern coast of England, seventy-four miles from London. The area of the municipal borough is 1,636 acres, and of the parliamentary borough 4,617 acres. The population (1901) was 65,528.

Hastings is of great antiquity, and was a place of some importance in the time of the Anglo-Saxons. Like the other principal seaports on the southern coast, it was garrisoned by Harold in view of the possible landing of William the Conqueror, to whom, however, it surrendered without striking a blow, and who selected it as the site of a permanent camp, and erected a wooden fortress on the cliff on which the castle was afterward built. From this camp William, on the morning of October 14, 1066, set out to meet Harold at Senlac Hill; and after his great victory there he returned to it, and remained encamped five days in the hope of receiving the homage of the English.

HASTINGS, WARREN, the first governor-general of British India, was born on December 6, 1732, in the little hamlet of Churchill, in Oxfordshire. He came of a family which had been settled for many generations in the adjoining village of Daylesford. Young Hastings received the elements of education at a charity school in his native village. In 1749 he determined to seek his fortune as a "writer" in Bengal.

When Hastings landed at Calcutta in October, 1750, the affairs of the East India Company were at a low ebb. Throughout the entire south of the peninsula French influence was predominant. The settlement of Fort St. George or Madras, captured by force of arms, had only recently been restored in accordance with a clause of the peace of Aix-la-Chapelle. The brilliant genius of Dupleix everywhere overshadowed the native imagination, and the star of Clive had scarcely yet risen above the horizon. At an early date Hastings was placed in charge of an *aurang* or factory in the interior, where his duties would be to superintend the weaving of silk and cotton goods under a system of money advances. In 1755 he was transferred to Kásimbázár, the river port of the native capital of Múrhshidábád. In 1756 the old nawáb died, and was succeeded by his grandson, Siráj-ud-Daulah, a spoilt boy of nineteen, whose name is indelibly associated with the tragedy of the Black Hole. When that passionate young prince, in revenge for a

fancied wrong, resolved to drive the English out of Bengal, his first step was to occupy the fortified factory at Kásimbázár, and make prisoners of Hastings and his companions. Hastings was soon released at the intercession of the Dutch resident, and made use of his position at Múrhshidábád to open negotiations with the English fugitives at Falta, the site of a Dutch factory near the mouth of the Hooghly. In later days he used to refer with pride to his services on this occasion, when he was first initiated into the wiles of Oriental diplomacy. After a while, he found it necessary to fly from the Mahometan court, and join the main body of the English at Falta. When the relieving force arrived from Madras, under Colonel Clive and Admiral Watson, Hastings enrolled himself as a volunteer, and took part in the action which led to the recovery of Calcutta. Clive showed his appreciation of Hastings' merits, by appointing him, in 1758, to the important post of resident at the court of Múrhshidábád. It was there that he first came into collision with the Bengálí Bráhmán, Nandkumar, whose subsequent fate throws so deep a shadow upon his own fair fame. During his three years of office as resident he was able to render not a few valuable services to the company; but it is more important to observe that his name nowhere occurs in the official lists of those who derived pecuniary profit from the necessities and weakness of the native chiefs. In 1761 he was promoted to be member of council. Macaulay, in his celebrated essay, has said that "of the conduct of Hastings at this time little is known." As a matter of fact, the book which Macaulay was professing to review, describes at length the honorable part consistently taken by Hastings in opposition to the great majority of the council. Sometimes in conjunction only with Vansittart, sometimes absolutely alone, he protested unceasingly against the policy and practices of his colleagues. On one occasion he was stigmatized in a minute by Mr. Batson with "having espoused the Nawab's cause, and as a hired solicitor defended all his actions, however dishonorable and detrimental to the company." An altercation ensued. Batson gave him the lie, and struck him in the council chamber. When war was actually begun, Hastings officially recorded his previous resolution to have resigned, in order to repudiate responsibility for measures which he had always opposed. Waiting only for the decisive victory of Buxar over the allied forces of Bengal and Oudh, he resigned his seat, and sailed for England in November, 1764.

After fourteen years' residence in Bengal Hastings did not return home a rich man, estimated by the opportunities of his position. According to the custom of the time he had augmented his slender salary by private trade. At a later date, he was charged by Burke with having taken up profitable contracts for supplying bullocks for the use of the Company's troops. It is admitted that he conducted by means of agents a large business in timber in the Gangetic sandarbans. While at home Hastings is said to have attached himself to literary society; and it may be inferred from his own letters that he now made the personal acquaintance of Samuel Johnson and Lord Mansfield. In 1766 he was called upon to give evidence before a committee of the House of Commons upon the affairs of Bengal. In the winter of 1768 he received the appointment of second in council at Madras. Among his companions on his voyage round the Cape were the Baron Imhoff, a speculative portrait painter, and his wife, a lady of some personal attractions and great social charm, who was destined henceforth to be Hastings' life-long companion. Of his two years' work at Madras it is needless to speak in detail.

In the beginning of 1772 his ambition was stimulated

by the nomination to the second place in council at Bengal with a promise of the reversion of the governorship when Mr. Cartier should retire. Since his departure from Bengal in 1764 the situation of affairs in that settlement had scarcely improved. The second governorship of Clive was marked by the transfer of the *diwani* or financial administration from the Mogul emperor to the company, and by the enforcement of stringent regulations against the besetting sin of speculation. But Clive was followed by two inefficient successors; and in 1770 occurred the most terrible Indian famine on record, which is estimated to have swept away one-third of the population. In April, 1772, Warren Hastings took his seat as president of the council at Fort William. All the officers of the administration were transferred from Mirshidabad to Calcutta, which Hastings boasted at this early date he would make the first city in Asia. This reform involved the ruin of many native reputations, and for a second time brought Hastings into collision with the wily Brahman, Nandkumar. The Mahrattas at this time had got possession of the person of the Mogul emperor, Shah Alam, from whom Clive obtained the grant of Bengal in 1765, and to whom he assigned in return the districts of Allahabad and Kora and a tribute of £300,000. With the emperor in their camp, the Mahrattas were threatening the province of Oudh, and causing a large British force to be cantoned along the frontier for its defense. Warren Hastings, as a deliberate measure of policy, withheld the tribute due to the emperor, and resold Allahabad and Kora to the wazir of Oudh. The Mahrattas retreated, and all danger for the time was dissipated by the death of their principal leader. The wazir now bethought him that he had a good opportunity for satisfying an old quarrel against the adjoining tribe of Rohillas, who had played fast and loose with him while the Mahratta army was at hand. The Rohillas were a race of Afghan origin, who had established themselves for some generations in a fertile tract west of Oudh, between the Himalayas and the Ganges, which still bears the name of Rohilkhand. They were not so much the occupiers of the soil, as a dominant caste of warriors and freebooters. But in those troubled days their title was as good as any to be found in India. After not a little hesitation, Hastings consented to allow the company's troops to be used to further the ambitious designs of his Oudh ally, in consideration of a sum of money which relieved the ever-pressing wants of the Bengal treasury. The Rohillas were defeated in fair fight.

Meanwhile, the affairs of the East India Company had again come under the consideration of parliament. The regulating act, passed by Lord North's ministry in 1773, effected considerable changes in the constitution of the Bengal Government. The council was reduced to four members with a governor-general, who were to exercise certain indefinite powers of control over the presidencies of Madras and Bombay. Hastings was named in the Act as governor-general for a term of five years. The council consisted of General Clavering and the Hon. Colonel Monson, two third-rate politicians of considerable parliamentary influence; Philip Francis, then only known as an able permanent official; and Barwell, of the Bengal Civil Service. At the same time a supreme court of judicature was appointed, composed of a chief and three puisne judges, to exercise an indeterminate jurisdiction at Calcutta. The chief-justice was Sir Elijah Impey, a school-fellow of Hastings at Westminster. The new members of council disembarked at Calcutta on October 19, 1774; and on the following day commenced the long feud which scarcely terminated twenty-one years later with the acquittal of Warren

Hastings by the House of Lords. Macaulay states that the members of council were put in ill-humor because their salute of guns was not proportionate in their dignity. Taking advantage of an ambiguous clause in their commission, the majority of the council (for Barwell uniformly sided with Hastings) forthwith proceeded to pass in review the recent measures of the governor-general. All that he had done they condemned; all that they could they reversed. Hastings was reduced to the position of a cipher at their meetings. After a time they lent a ready ear to detailed allegations of corruption brought against him by his old enemy Nandkumar. To charges from such a source, and brought in such a manner, Hastings disdained to reply, and referred his accuser to the supreme court. The majority of the council, in their executive capacity, resolved that the governor-general had been guilty of speculation, and ordered him to refund. A few days later Nandkumar was thrown into prison on a stale charge of forgery, tried before the supreme court sitting in bar, found guilty by a jury of Englishmen, and sentenced to be hanged. That Hastings set this prosecution in motion, no reasonable person can doubt; but it is by no means clear that Chief-Justice Impey is free from blame. The majority of the council abandoned their supporter, who was executed in due course. While the strife was at its hottest Hastings sent an agent to England, with a general authority to place his resignation in the hands of the company under certain conditions. The agent thought fit to exercise that authority. The resignation was promptly accepted, and one of the directors was appointed to the vacancy. But in the meantime Colonel Monson had died, and Hastings was thus restored, by virtue of his casting vote, to the supreme management of affairs. He refused to ratify his resignation; and when Clavering attempted to seize on the governor-generalship, he obtained an opinion of the supreme court in his own favor. From that time forth, though he could not always command an absolute majority in council, Hastings was never again subjected to gross insult, and his general policy was able to prevail.

A crisis was now approaching in foreign affairs which demanded all the experience and all the genius of Hastings for its solution. Bengal was prosperous and free from external enemies on every quarter. The government of Bombay had hurried on a rupture with the Mahratta confederacy at a time when France was on the point of declaring war against England, and when the mother-country found herself unable to subdue her rebellious colonists in America. Hastings did not hesitate to take upon his own shoulders the whole responsibility of military affairs. All the French settlements in India were promptly occupied. On the part of Bombay, the Mahratta war was conducted with procrastination and disgrace. Hastings amply avenged the capitulation of Wargoon by the complete success of his own plan of operations. Colonel Goddard with a Bengal army marched across the breadth of the peninsula, from the valley of the Ganges to the western sea, and achieved almost without a blow the conquest of Guzerat. Captain Popham, with a small detachment, stormed the rocky fortress of Gwahor; then deemed impregnable and the key to Central India; and by this feat held in check Sindia, the most formidable of the Mahratta chiefs. The bhonsla, or Mahratta raja of Nagpur, whose dominions bordered on Bengal, was won over by the diplomacy of an emissary of Hastings. But while these events were taking place, a new source of embarrassment had arisen at Calcutta. The supreme court, whether rightly or wrongly, assumed a jurisdiction of first instance over the entire province of Bengal. The English common law, with all the

absurdities and rigors of that day, was arbitrarily extended to an alien system of society. *Zamindárs*, or government renters, were arrested on mesne process; the sanctity of the *zanána*, or women's chamber, as dear to Hindus as to Mahometans, was violated by the sheriff's officer; the deepest feelings of the people and the entire fabric of the revenue administration were alike disregarded. On this point the entire council acted in harmony. Hastings and Francis went joint-bail for imprisoned natives of distinction. At last, after the dispute between the judges and the executive threatened to become a trial of armed force, Hastings set it at rest by a characteristic stroke of policy. A new judicial office was created in the name of the Company, to which Sir Elijah Impey was appointed, though he never consented to draw the additional salary offered to him. The understanding between Hastings and Francis, originating in this state of affairs, was for a short period extended to general policy. But a difference of interpretation arose. Hastings recorded in an official minute that he had found Francis' private and public conduct to be "void of truth and honor." They met as duelists. Francis fell wounded, and soon afterward returned to England.

The Mahratta war was not yet terminated, but a far more formidable danger now threatened the English in India. The imprudent conduct of the Madras authorities had irritated beyond endurance the two greatest Mussulman powers in the peninsula, the nizâm of the Deccan and Hyder Ali, the usurper of Mysore, who began to negotiate an alliance with the Mahrattas. A second time the genius of Hastings saved the British empire in the east. On the arrival of the news that Hyder had descended from the highlands of Mysore, cut to pieces the only British army in the field, and swept the Carnatic up to the gates of Madras, he at once adopted a policy of extraordinary boldness. He signed a blank treaty of peace with the Mahrattas, who were still in arms, reversed the action of the Madras Government toward the nizâm, and concentrated all the resources of Bengal against Hyder Ali. Sir Eyre Coote, a general of renown in former Carnatic wars, was sent by sea to Madras with all the troops and treasure that could be got together; and a strong body of reinforcements subsequently marched southward under General Leslie along the coast line of Orissa. The landing of Coote preserved Madras from destruction, though the war lasted through many campaigns and only terminated with the death of Hyder.

The remainder of Hastings' term of office in India was passed in comparative tranquillity, both from internal opposition and foreign war. The center of interest now shifts to the India House and to the British Parliament. The long struggle between the company and the ministers of the crown for the supreme control of Indian affairs and the attendant patronage had reached its climax. The decisive success of Hastings' administration alone postponed the inevitable solution. His original term of five years would have expired in 1778; but it was annually prolonged by special Act of Parliament until his voluntary resignation. Though Hastings was thus irremovable, his policy did not escape censure. On one occasion Dundas carried a motion in the House of Commons censuring Hastings, and demanding his recall. The directors of the company were disposed to act upon this resolution; but in the court of proprietors, with whom the decision ultimately lay, Hastings always possessed a sufficient majority. Fox's India Bill led to the downfall of the Coalition ministry in 1783. The Act which Pitt successfully carried in the following year introduced a new constitution, in which Hastings felt that he had no place. In February, 1785, he finally sailed

from Calcutta, after a dignified ceremony of resignation, and amid enthusiastic farewells from all classes.

On his arrival in England, after a second absence of sixteen years, he was not displeased with the reception he met with at court and in the country. A peerage was openly talked of as his due, while his own ambition pointed to some responsible office at home. Pitt had never taken sides against him, while Lord Chancellor Thurlow was his pronounced friend. But he was now destined to learn that his enemy, Francis, whom he had discomfited in the council chamber at Calcutta, was more than his match in the parliamentary arena. Edmund Burke had taken the subject races of India under the protection of his eloquence. Francis, who had been the early friend of Burke, supplied him with the personal animus against Hastings, and with the knowledge of details which he might otherwise have lacked. The Whig party on this occasion unanimously followed Burke's lead. Dundas, Pitt's favorite subordinate, had already committed himself by his earlier resolution of censure; and Pitt was induced by motives which are still obscure to incline the ministerial majority to the same side. To meet the oratory of Burke and Sheridan and Fox, Hastings wrote an elaborate minute, and subsidized a swarm of pamphleteers. The impeachment was decided upon in 1786, but the actual trial did not commence until 1788. For seven years Hastings was upon his defense on the charge of "high crimes and misdemeanors." During this anxious period he appears to have borne himself with characteristic dignity, such as is consistent with no other hypothesis than the consciousness of innocence. At last, in 1795, the House of Lords gave a verdict of not guilty on all the charges laid against him; and he left the bar at which he had so frequently appeared, with his reputation clear, but ruined in fortune. However large the wealth he brought back from India, all was swallowed up in defraying the expenses of his trial. At last, when he was reduced to actual destitution, it was arranged that the East India Company should grant him an annuity of £4,000 for a term of years, with £90,000 paid down in advance. This annuity expired before his death; and he was compelled to make more than one fresh appeal to the bounty of the Company, which was never withheld. Shortly before his acquittal he had been able to satisfy the dream of childhood, by buying back the ancestral manor of Daylesford, where the remainder of his life was passed in honorable retirement. In 1813 he was called on to give evidence upon Indian affairs before the two Houses of Parliament, which received him with exceptional marks of respect. The university of Oxford conferred on him the honorary degree of D.C.L.; and in the following year he was sworn of the Privy Council, and took a prominent part in the reception given to the duke of Wellington and the allied sovereigns. He died on August 22, 1818, in his eighty-sixth year, and lies buried behind the chancel of the parish church, which he had recently restored at his own charges.

HASTINGS, FRANCIS RAWDON HASTINGS, FIRST MARQUIS OF, ranks among those governors-general of India who, completing the work of Clive and Warren Hastings, achieved the creation of the Indian empire of England. The services of Lord Hastings in this respect were special and important. He was both governor-general and commander-in-chief in India from 1813 till the end of 1822; during that period he carried two important wars, the Nepaulese and the Mahratta, to a successful issue; while adding to the territories of the East India Company, he in several respects altered and improved their policy; and by the sagacity and at the same time the generosity of his own administration he won

reverence from the natives and left a great name in India.

Lord Hastings was in no way connected with Warren Hastings; his family name was Rawdon. His father, Sir John Rawdon of Moira in the county of Down, fourth baronet, was created Baron Rawdon of Moira, and afterward Earl of Moira, in the Irish peerage. His mother was the Lady Elizabeth Hastings, daughter of the ninth earl of Huntingdon. Lord Rawdon, as he was then called, having gone at an early age to the university of Oxford, joined the army in his seventeenth year as ensign in the 15th foot. His life, henceforth, was entirely spent in the service of his country, and may naturally be divided into four periods—from 1775 to 1782 he was engaged with much distinction in the American war; from 1783 to 1813 he held various high appointments at home, and took an active part in the business of the House of Lords; from 1813 to 1823 was the period of his labors in India; after retiring from which, in the last years of his life (1824–1826), he was governor of Malta.

In America Lord Rawdon served at the battles of Bunker Hill, Brooklyn, White Plains, Monmouth, and Camden, at the attacks on Forts Washington and Clinton, and at the siege of Charleston. In fact he was engaged in all the chief operations of the war.

In 1793 Lord Rawdon succeeded his father as earl of Moira. In 1794 he was sent with 10,000 men from Southampton to Ostend to reinforce the duke of York and the allies in Flanders. In 1803 he was appointed commander-in-chief in Scotland, and in 1804 he married Flora Muir Campbell, countess of Loudon in her own right. The opposition coming into power in 1806, Lord Moira, who had always voted with them, received the place of master-general of the ordnance.

In 1812 Lord Moira received the order of the Garter, and in the same year was appointed governor-general and commander-in-chief of India. He landed in Calcutta, and assumed office in succession to Lord Minto in October, 1813. The Goorkhas, a brave and warlike little nation, failing to extend their conquests in the direction of China, had begun to encroach on territories held or protected by the East India Company; especially they had seized the districts of Bootul and Seoraj, in the northern part of Oudh, and when called upon to relinquish these, they deliberately elected (April, 1814) to go to war rather than do so. Lord Moira, having traveled through the northern provinces and fully studied the question, declared war against Nepal (November, 1814). His campaign against the Goorkhas was successful, and he was created marquis of Hastings in 1816.

In 1819 he obtained the cession by purchase of the island of Singapore. In finance his administration was very successful, as notwithstanding the expenses of his wars he showed an annual surplus of two millions sterling. He labored much at law reform, and he succeeded in greatly raising the status and character of the civil service in India. Brilliant and beneficent as his career had been, Lord Hastings did not escape, any more than Clive, Warren Hastings, or Lord Wellesley, the assaults of unjust detraction. His last years of office were embittered by the discussions on a matter very notorious at the time, namely, the affairs of the banking-house of W. Palmer and Company. The whole affair was mixed up with insinuations against Lord Hastings, especially charging him with having been actuated by favoritism toward one of the partners in the firm. He tendered his resignation in 1821, though he did not leave India till January, 1823. In 1824 he received the comparatively small post of governor of Malta, in which island he introduced many reforms and endeared himself to the inhabitants. He died in 1826.

HASTINGS, a rapidly growing town of Nebraska, is situated in Adams county, of which it is the capital. It is a railway center of some importance, and carries on considerable overland commerce. It has good educational, church, banking, and telegraph facilities, and of late years has rapidly increased in its commercial interests, while its population has been more than quadrupled in the last decade, making the number of inhabitants (1900), 7,188. The public buildings include a court-house, city hall, and the State insane asylum. There are four schools, two colleges, and seven churches. The city is lighted by gas and electricity, and has a water-works system costing \$100,000; a system of sewerage is in course of construction. There are thirteen miles of street railroad, and police and fire departments are maintained. The assessed valuation (1899), was \$1,667,900.

HAT, a covering for the head worn by both sexes, and distinguished from the cap or bonnet by the possession of a brim. The modern hat can be traced back to the *petasus* worn by the ancient Romans when on a journey; and hats with brims were also used, probably on like occasions, by the earlier Greeks. It was not until after the Norman conquest that the use of hats began in England. A "hatte of biever" about the middle of the twelfth century was worn by some one of the "nobels of the lande, mett at Clarendon," and Froissart describes hats and plumes which were worn at Edward's court in 1340, when the Garter was instituted. In the thirteenth century the use of the scarlet hat which distinguishes cardinals was sanctioned by Pope Innocent IV. During the reign of Charles I. the Puritans affected a steeple crown and broad-brimmed hat, while the Cavaliers adopted a lower crown and a broader brim ornamented with feathers. Still greater breadth of brim and a profusion of feathers were fashionable characteristics of the hats in the time of Charles II., and the gradual expansion of brim led to the device of looping or tying up that portion. Hence arose various fashionable "cocks" in hats, such as the "Monmouth cock," etc.; and ultimately, by the looping up equally of three sides of the low-crowned hat, the cocked hat which prevailed throughout the eighteenth century was elaborated. Since the beginning of the present century the cocked hat as an ordinary article of dress has disappeared.

Until recent times hats were principally made by the process of felting. At the present day the trade is divided into two distinct classes. The first and most ancient is concerned with the manufacture of felt hats, and the second has to do with the recent but now most extensive and important manufacture of silk or dress hats.

As now made, felt hats are of three different kinds, plain soft, plain hard, and "napped" or "ruffed" felts. There is a great range in the quality of felt hats, the finer and most expensive qualities being made entirely of fur; for commoner qualities a mixture of fur and Saxony wool is used; and for the lowest kinds wool alone is employed. The processes and apparatus necessary for making hats of fur differ also from those required in the case of woolen bodies; and in large manufacturing machinery is now generally employed for operations which at no distant date were entirely manual. In the smaller factories, and for special objects, the old hand processes are still in operation.

The silk hat, which has now become coëxtensive with civilization, is an article of recent introduction. It was known in Florence about a century ago; but its manufacture was not introduced into France till about 1825, and its development has taken place entirely since that period. A silk hat consists of a light stiff body covered with a plush of silk, the manufacture of which, in a

brilliant glossy condition, is the most important element in the industry; and in that manufacture the French are without equals. Originally the bodies were made of felt and various other materials, but now calico is almost exclusively used.

The calico is first stiffened with a varnish of shellac, and then cut into pieces sufficient for crown, side, and brim. The side-piece is wound round a wooden hat block, and its edges are joined by hot ironing, and the crown-piece is put on and similarly attached to the side. The brim, consisting of three thicknesses of calico cemented together, is now slipped over and brought to its position, and thereafter a second side-piece and another crown are cemented on. The whole of the body thus prepared, now receives a coat of size, and subsequently it is varnished over, and thus it is ready for the operation of covering. In covering this body, the under brim, generally of merino, is first attached, then the upper brim, and lastly the crown and side sewed together are drawn over. All these, by hot ironing and stretching, are drawn smooth and tight, and as the varnish of the body softens with the heat, body and cover adhere all over to each other without wrinkle or pucker. Dressing and polishing by means of damping, brushing, and ironing, come next, after which the hat is "velured" in a revolving machine by the application of haircloth and velvet velures, which cleans the nap and gives it a smooth and glossy surface. The brim has only then to be bound, the linings inserted, and the brim finally curled, when the hat is ready for use. In all kinds of hat-making the French excel, and in such centers as Anduze, Lyons, and Paris, the trade is very extensive and important. In the United Kingdom the felt hat trade is principally centered at Denton and other localities in the neighborhood of Manchester, and in the United States New York and New Jersey enjoy the greater part of the industry.

HATFIELD, or BISHOP'S HATFIELD, a quiet, old-fashioned market-town of England, in the county of Hertford, seventeen and three-quarter miles north-northwest of London. In the vicinity is Hatfield House, on the site of a palace of the bishops of Ely, which was erected about the beginning of the twelfth century. In 1538 the manor was resigned to Henry VIII. by Bishop Goodrich, in exchange for certain lands in Cambridge, Essex, and Norfolk, and after that monarch the palace was successively the residence of Edward VI. immediately before his accession, of Queen Elizabeth during the reign of her sister Mary, and of James I. The last-named exchanged it in 1607 for Theobalds, near Cheshunt, in the same county, an estate of Sir Robert Cecil, afterward earl of Salisbury, in whose family Hatfield House has since remained. It is now the residence of the marquiss of Salisbury, prime minister of England.

HATHRAS, or HATRAS, a town in the Aligarh district, Northwestern Provinces, India. It is well built, with numerous brick and stone houses, and is a prosperous trading center. Population 23,589, comprising 21,121 Hindus and 2,468 Mahometans.

HATTINGEN, a town of Westphalia, Prussia, in the government district of Arnsberg and the circle of Bochum, is situated on the river Ruhr, about twenty-one miles northeast of Düsseldorf. Population (1901), about 10,000.

HATTO I., tenth archbishop of Mainz, was born of a Swabian family about the middle of the ninth century. Educated at the monastery of Ellwangen or at Fulda, he attracted the attention of the emperor Arnulf, who in 888 made him abbot of Reichenau, in 889 abbot of Ellwangen, and in 891 archbishop of Mainz. During his reign Hatto acquired much ecclesiastical as well as political power. He presided over the council at Tribur or

Teuver (895), at which the emperor and twenty-six or twenty-seven bishops attended, and was employed as ambassador to Charles the Simple and the king of Lorraine at their conference at Saint Goar in 899. On the death of Arnulf in 900, Hatto became regent and guardian of Louis, and in the contest with the dukes of Babenberg treacherously betrayed into the emperor's hands Count Adalbert, who was one of their partisans. Under Louis' successor, Conrad I., Hatto retained his influence, but he died in 913, two years after Conrad's accession. Another but less probable account has it that he was killed at the battle of Heresburg in 912. There is a tradition, due probably to his ambition and violence, that his corpse was seized by the devil and thrown into the crater of Mount Etna. The tradition of the Mouse Tower on the Rhine at Bingen is connected with another Hatto, also archbishop of Mainz (968-970).

HATVAN, a market-town in the county of Heves, Hungary, is situated on the left bank of the Zagyva, at the junction of the Pest-Miskolcz, Hatvan-Rutka, and Hatvan-Szolnok lines of railway, about thirty miles east-northeast of Budapest. Population, 4,500.

HATZFELD, a market-town in the county of Torontál, Hungary, on the Austrian state line of railway, about twenty-two miles west of Temesvár. Population about 10,000.

HAUCH, JOHANNES CARSTEN, Danish poet, was born of Danish parents residing at Frederikshald in Norway in 1790. His first dramas, *The Journey to Ginistan* and *The Power of Fancy*, appeared in 1816 and 1817, and were followed by *Flosaura*; but these works attracted little or no attention. Hauch therefore gave up all hope of fame as a poet, and resigned himself entirely to the study of science, to pursue which he went abroad. He returned to dramatic production, and published *The Hamadryad*, *Bajazet*, *Tiberius*, *Gregory VII.*, *The Death of Charles V.* (1831) and *The Siege of Maestricht* (1832). Hauch then turned to novel writing, and published in succession four romances—*Vilhelm Zabern*, 1834; *Guldmageren*, 1836; *A Polish Family*, 1829; and *The Castle on the Rhine*, 1845. In 1842 he collected his shorter *Poems*. In 1846 he was appointed professor of the Scandinavian languages in Kiel. He produced several tragedies, among which may be mentioned *Svend Grathe*, 1841; *The Sisters at Kinnickullen*, 1849; *Marsk Stig*, 1850; *Honor Lost and Won*, 1831; and *Tycho Brahe's Youth*, 1852. From 1858 to 1860 Hauch was director of the Danish National Theater; he produced three more tragedies—*The King's Favorite*, 1859; *Henry of Navarre*, 1863; and *Julian the Apostate*, 1868. In 1861 he published another collection of *Poems*, and in 1862 the historical epic of *Valdemar Atterdag*. He died in Rome in 1872.

HAUFF, WILHELM, a popular German novelist, was born at Stuttgart, 1802. In 1818 he was sent to the *Klosterschule* at Blaubeuren, and two years later entered the seminary at Tübingen. After having completed, in 1824, his philosophical and theological studies and taken his degree, he acted for two years as private tutor, and assumed, in January, 1827, the editorship of the *Morgenblatt*. In the following month he married, and led a happy and quiet life, which was ended by a fatal illness on November 18th of the same year.

HAUG, JOHANN CHRISTOPH FRIEDRICH, a German epigrammatist, was born March 19, 1761, at Niederstotzingen, in Würtemberg, and died in 1829.

HAUG, MARTIN, Orientalist, was born in 1827, near Balingen, Würtemberg, and died in 1876.

HAUGE, HANS NIELSEN, founder of a religious sect within the Lutheran Church of Norway and Denmark, was born in the former country, in the parish of Thunø, April 3, 1771, and died in 1824.

HAUPT, MORITZ or **MORIZ**, one of the principal representatives at once of classical and of vernacular philology in Germany, was born at Zittau, in Lusatia, in 1808, and died in 1874.

HAUPTMANN, MORITZ, was born at Dresden, October 13, 1792, and studied music under Scholz, Lanska, Grosse, and Morlacchi, the rival of Weber. Afterward he completed his education as a violinist and composer under Spohr. For a time also Hauptmann was employed as an architect, but all other pursuits gave place to music, and a grand tragic opera, *Mathilde*, belongs to the period just referred to. In 1822 he entered the orchestra of Cassel, again under Spohr's direction, and it was then that he first taught composition and musical theory to such men as Ferdinand David, Burgmüller, Kiel, and others. His compositions at this time chiefly consisted of motets, masses, cantatas, and songs. His opera *Mathilde* was performed at Cassel with great success. In 1842 Hauptmann obtained the position of orator at the Thomas-school of Leipzig (long previously occupied by the great Johann Sebastian Bach). He died on January 3, 1868. Hauptmann's compositions are marked by symmetry and perfection of workmanship rather than by spontaneous invention.

HAURAN. See **BASHAN**.

HAUSER, KASPAR, a German youth whose life was remarkable from the circumstances of apparently inexplicable mystery in which it was involved. He appeared on May 20, 1828, in the streets of Nuremberg, dressed in the garb of a peasant, and with such a helpless and bewildered air that he attracted the attention of the passers-by. In his possession was found a letter purporting to be written by a poor laborer, stating that the boy was given into his custody on October 7, 1812, and that according to agreement he had instructed him in reading, writing, and the Christian religion, but that up to the time fixed for relinquishing his custody he had kept him in close confinement. Along with this letter was inclosed another purporting to be written by the boy's mother, stating that he was born on April 30, 1812, that his name was Kaspar, and that his father, formerly a cavalry officer in the sixth regiment at Nuremberg, was dead. The appearance, bearing, and professions of the youth corresponded closely with these credentials. He showed a repugnance to all nourishment except bread and water, was seemingly ignorant of outward objects, wrote his name as Kaspar Hauser, and said that he wished to be a cavalry officer like his father. For some time he was detained in prison at Nuremberg as a vagrant, but on July 18, 1828, he was delivered over to the care of Professor Daumer, who undertook to be his guardian and to take the charge of his education. On October 17, 1829, he was found to have received a wound in the forehead, which according to his own statement had been inflicted on him by a man with a blackened face. Having on this account been removed to the house of a magistrate and placed under close surveillance, he was visited by Earl Stanhope, who became so interested in his history that he sent him to Ansbach to be educated. After this he became clerk in the office of Feuerbach, president of the court of appeal, and his strange history was almost forgotten by the public when the interest in it was suddenly revived by his death on December 14, 1833, from a deep wound on his left breast. He affirmed that the wound was inflicted by a stranger, but many believed it to be the work of his own hand, and that he did not intend it to be fatal, but only so severe as to give a sufficient coloring of truth to his story.

HAÜY, RENÉ JUST, an eminent French mineralogist, commonly styled the **Abbé Haüy**, from being an honor-

ary canon of Notre Dame, was born at St. Just, in the department of Oise, February 28, 1743, and died in 1822.

HAVANA, HAVANNAH, or HABANA, more fully **San Cristobal de la Havana**, the capital of Cuba, and one of the principal seats of commerce in the New World, is situated on the northern coast of the island. From the sea it presents a picturesque appearance. The background is indeed tame; but the long lines of fortifications, the church-towers, and the shipping relieve the somewhat tawdry effect of the gayly colored houses. Most of the houses are built of solid stone, and have flat roofs, after the manner in vogue in southern Spain, and, as the erection of wooden buildings has been illegal since 1772, it is only in the suburban districts that they are at all common. The lavish use of white marble in the decoration both of shops and dwelling-houses is one of the peculiarities of the popular taste; and it is worthy of remark that, though the native quarries would supply what is wanted, the marble is brought from Genoa. Cafés, restaurants, clubs, and casinos are both exceedingly numerous and largely frequented, forming a good indication of that general absence of domestic life among the white population which surprises the European visitant. Havana is still, as of yore, a city of smells and noises. There is no satisfactory cleaning of the streets or draining of the subsoil, and the harbor is visibly rendered foul by the impurities of the town. Victorias,—of which it is the Cuban boast that there are 6,000,—volantes, and other vehicles are driven through the thoroughfares with the utmost recklessness; and tramways and railways in the American fashion contribute to the confusion.

The principal defenses of Havana are the Castillo de la Punta, to the west of the harbor entrance, the Castillo del Morro and San Carlos de la Cabaña to the east, the Santo Domingo de Atares, which lies at the head of the western arm of the bay, and commands both the city and the neighborhood, and the Castillo del Principe, situated on an eminence to the west, and forming the terminus of the great Paseo Militar. El Morro, as it is popularly called, was first erected in 1589, but additions have been frequently made. La Punta, a much smaller fort, is of the same period. The castle of Atares dates from about 1763, when the Conde de Rical was governor of the island. Cabaña, which alone has accommodation for 4,000 men, fronts the bay for a distance of 800 yards, and is defended on the land side by three bastions. To the east there lies a smaller fort, No. 4, or San Diego, on a hill about 100 feet high.

Of the churches in the city, which number more than a score, the most noteworthy is the cathedral erected in 1724 by the Jesuits. Externally it is plain though symmetrical; but within it has richly frescoed walls, a floor of variegated marble, and costly altars. In the wall of the chancel, a second-rate medallion and a sordid inscription distinguish the tomb of Columbus, whose remains were removed thither in 1796.

Besides the university established in 1728, the city possesses a theological seminary, a military school, and a school of art. The governor and the bishop, before the Spanish evacuation, here had their respective palaces, the former a large yellow stone building in the Plaza de Armas; a large prison, erected in 1771, with barracks for a regiment, forms a striking object in the general view of the city; and among the other public buildings are the exchange, the custom-house (formerly the church of San Francisco), and the maestranza or headquarters of the artillery. Of the theaters, which have still to compete with the bull-ring and the cock pit, the most important is the Tacon, erected in 1838, and

capable of accommodating about 3,000 persons. The promenades, drives, and public gardens form a notable feature of Havana; it is sufficient to mention the Plaza de Armas, with a statue of Ferdinand VII; the Prado or Paseo Isabel, a long and handsome boulevard laid out in the eighteenth century; the Campo del Marte or drill-park; the Parque Isabel, the Paseo Tacon, the botanical gardens, and the gardens of Los Molinos, the suburban residence of the captain-general. The palm-tree avenues of Los Molinos are unusually fine.

The bay of Havana makes one of the finest harbors in the world, easy of access, spacious enough to contain about 1,000 large vessels, deep enough to allow them to come close up to the wharves, and, except in the case of a hurricane, well protected on all sides. The entrance, encumbered by neither bar nor rock, is 980 feet wide and 4,200 feet long. Within, the bay breaks up into three distinct arms, named respectively *Marimaleña* or *Regla Bay*, *Guasabacoa Bay*, and *El Fonda* or *Bay of Atares*. The wharves are well built, and a good floating dock is maintained by a private company. On the left hand of the entrance stands a lofty light-house tower.

In spite of high tariffs and civil wars, and the competition of Matanzas, Cardenas, Cienfuegos and other Cuban ports open to foreign trade in modern times, the commerce of Havana continues to increase. The staple manufacturing industry of Havana is that of tobacco. Of the cigar factories, more than a hundred may be reckoned as of the first class. The Royal and Imperial Factory of La Honradez, which occupies a whole square, and is considered one of the sights of the city, exported in 1900 9½ million packets of cigarettes. Besides the making of boxes and barrels, and other articles necessarily involved in its sugar and tobacco trade, Havana also prosecutes to some extent the building of carriages and ships, and the manufacture of iron and machinery; but the weight of taxation is too great to allow the development of any business requiring great capital. There are six banks in the city, the most important being the Spanish Bank, through which formerly all the Government paper was issued.

Havana has steam communication with New York, Baltimore, Philadelphia and New Orleans; and with several ports in England, Spain and France. It is the terminus of a railway system which reaches Cardenas, Cienfuegos Matanzas, Batabano, etc., and short lines run out to the Bay of Havana and Marianas. Telegraphs radiate to all parts of the island, and a submarine cable to Key West forms part of the line of communication between Aspinwall and New York.

The population of Havana and its suburbs is 240,000. Among the white population the proportion of males to females is extraordinarily high; according to the official returns, there die annually 3,628 white males to 1,264 white females. The average rate of mortality is high, but has been much reduced during its occupation by the United States, prior to the granting of home rule (1902) to Cuba.

Havana, originally founded by Diego Velasquez in 1515 on an unhealthy site near the present harbor of Baracon on the south coast, was removed to its present position about 1519, and soon began to be considered one of the most important places in the New World. In 1528 the buccaneers laid the settlement in ashes, but it was soon after restored by Da Soto, who built the fortress of La Fuerza. The residence of the captain-general was transferred to Havana from Santiago de Cuba in 1551; and in 1589, to protect the city, which had been plundered by the pirate Jacob Sores in 1555, and threatened by Drake in 1585, Philip II. of Spain ordered the erection of the Bateria de la Punta and the castle of El Morro or Los Tres Reyes. In the

course of the seventeenth century the port became the great rendezvous for the gold-ships of Spain, and the commercial center of the Spanish possessions in America. The English, under Admiral Pocock and the duke of Albemarle, captured Havana in 1762, but it was restored to the Spaniards on February 10, 1763, in exchange for the Floridas. (See CUBA.)

HAVELBERG, an ancient town of Brandenburg, Prussia, with a population of about 8,000.

HAVELOCK, SIR HENRY, an eminent British soldier, was born at Ford Hall, Bishop-Wearmouth, Sunderland, in 1795, and in 1815 accepted a second lieutenancy in the Rifle Brigade (95th). During the following eight years of service in Britain he read extensively and acquired a good acquaintance with the theory of war. He followed his brothers William and Charles to India, first qualifying himself in Hindustani under Doctor Gilchrist, a celebrated Orientalist. At the close of twenty-three years' service he was still a lieutenant, and it was not until 1838 that, after three years' adjutancy of his regiment, he became captain. Before this, however, he had held several staff appointments. During the first Afghan war he was present as aide-de-camp to Sir Willoughby Cotton at the capture of Ghazni, July 29, 1839, and at the occupation of Cabul. After a short absence in Bengal to secure the publication of his *Memoirs of the Afghan Campaign*, he returned to Cabul in charge of recruits, and became interpreter to General Elphinstone. In 1840, being attached to Sir Robert Sale's force, he took part in the Khurd-Cabul fight, in the celebrated passage of the defiles of the Ghilzees (1841), and in the fighting from Tezeen to Jellalabad. Here, after many months' siege, his column in a *sortie en masse* defeated Akbar Khan, April 7, 1842. He was now made deputy adjutant-general of the infantry division in Cabul, and in September he assisted at Jugalulluk, at Tezeen, and at the release of the British prisoners at Cabul, besides taking a prominent part at Istaliff. Having obtained a regimental majority he next went through the Mahratta campaign as Persian interpreter to Sir Hugh (Viscount) Gough, and distinguished himself at Maharajpûr in 1843, and also in the Sikh campaign at Mudki, Ferozeshah and Sobraon in 1845. In 1854 he became quartermaster-general, then full colonel, and lastly adjutant-general of the troops in India. In 1857 he was selected by Sir James Outram for the command of a division in the Persian campaign, during which he was present at the actions of Mohummarah and Ahwaz. Peace with Persia set him free just as the mutiny broke out; and he was chosen to command a column "to quell disturbances in Allahabad, to support Lawrence at Lucknow and Wheeler at Cawnpore, to disperse and utterly destroy all mutineers and insurgents." At Futteh-pûr, July 12th, at Aong and Pandoonudee on the 15th, at Cawnpur on the 16th, at Onao on the 29th, at Buserutunge on the 29th, and again on August 5th, at Boorhiya on August 12th, and at Bithoor on the 16th, he defeated overwhelming forces. Twice he advanced for the relief of Lucknow, but twice prudence forbade a reckless exposure of troops wasted by battle and disease in the almost impracticable task. Reinforcements arriving at last under Outram, he was enabled by the generosity of his superior officer to crown his success on September 25, 1857, by the capture of Lucknow. There he died November 24, 1857, of dysentery.

HAVERCAMP, SIGEBERT, classical editor and numismatist, was born at Utrecht, and died at Leyden, April 23, 1742.

HAVERFORDWEST, the chief town of Pembroke-shire, Wales. Population (1890), 7,500.

HAVERHILL, a city in Essex county, Mass., is

situated on the north bank of the Merrimack river, eighteen miles from its mouth, and opposite the town of Bradford and Groveland, with which it is connected by two fine bridges. It has railway communication with Boston, which is thirty-two miles south, and with Portland, seventy-eight miles north. The city contains a handsome soldiers' monument of white marble, erected in 1869, several public halls, including the city hall, the Freemasons' and Oddfellows' halls, and a public library with 30,000 volumes. Haverhill derives its prosperity from the manufacture of boots and shoes, chiefly of the finer kinds, in which about 150 firms are engaged. Besides these there are about forty manufactories of different articles used in this trade, as heels, lasts, shoe-nails, etc. The other manufactures include hats, paper-boxes, and woolen goods. The first settlement at Haverhill was made in 1640, and for seventy years as a frontier town it suffered much from savage attacks. A fine granite and bronze monument has been recently erected to commemorate the heroism of the early settlers. Haverhill was incorporated in 1645, and received a city charter in 1870. Population (1900), 37,175.

HAVERSTRAW, a New York town, lies in Rockland county, on the west bank of the Hudson (Tappan Bay), about thirty-five miles north of New York city. The town is noted principally for its manufactures of bricks and brick-making machinery. It also has other manufactures, among them being iron, machinery, paper, baskets, etc. Considerable trade with the adjoining county and Peekskill and New York city is carried on. Population 1900 (12th census), 5,935. It has banks, railroads and telegraphs.

HAVRE, LE (originally **HAVRE DE GRÂCE**), a town of France, the second to Marseilles in importance as a seaport, capital of an arrondissement in the department of Seine-Inférieure, is situated on the north bank of the estuary of the Seine, 143 miles northwest of Paris and fifty-five west of Rouen. The greater part of the town stands on a level plain, but from the heights on which Ingouville, since 1856 united to Havre, is situated, a charming and varied prospect is obtained. In the lower part of the town the streets run chiefly in straight lines, and they are grouped round the basins or docks which communicate by lockgates, and are placed so as to form a triangle entered from the Outer Port. The old fortifications surrounding the town were demolished in 1856, and it is now defended by forts erected on the heights of Ingouville and Sainte-Adresse. The principal street is the Rue de Paris, running from north to south in the center of the town, and among the principal promenades may be mentioned the Boulevard de Strasbourg, the Place Louis XVI., and the Jetée du Nord, which terminates in a lighthouse. Havre possesses a tribunal of the first instance, a tribunal of commerce, an exchange and chamber of commerce, a chamber of agriculture, a hydrographic school, and a communal college. The principal buildings are the churches of Notre Dame and St. Francis, the new Hôtel de Ville, the Musée, containing apartments for a library, and for art, antiquities, and natural history, and with statues in front of *Bernardin de St. Pierre* and *Casimir Delavigne*, natives of Havre, by David Angers; the theater, the clubhouse called the *Cercle du Commerce*, the new palace of justice, the marine arsenal, the town-house, the custom-house, and the Frascati bath-house. The docks are among the finest in the world, and consist of eight separate basins, which, with the late enlargement of the outer harbor, afford 150 acres of accommodation for vessels. The new entrance to the harbor has a width of 100 meters or 328 feet. Lines of rails have been laid along the docks. As these have absorbed much of the space on the quays,

loading is frequently a slow and tedious process, but the completion of the lately projected harbor affords all the facilities necessary in this respect. In the extensive shipbuilding yards of Havre the finest vessels of France are built, and many are also built for other countries. Havre is now fortified as a fleet station and harbor of war. The port has regular steam communication with London, Liverpool, Southampton, Dublin, Glasgow, Hull, Swansea, Bristol, Dunkirk, Brest, Cherbourg, Rotterdam, Hamburg, Copenhagen, St. Petersburg, Constantinople, West Indies, San Francisco, Vancouver Island, and New York. The average annual value of exports and imports is about 2,800,000,000 francs. The trade of Havre with the United States is very large, and it has always retained its superiority in the importation of cotton, one-third of which, however, it imports from other countries than America. It is also the chief port for the exportation of French goods to the United States, and an important point of emigration. Besides cotton its principal imports are petroleum, coals, wheat, woolen, silk, flax, mohair and jute tissues, spices, sugar, coffee, hides, dyewoods, and building timber. The principal exports are various French manufactured cloths, leather, jewelry, agricultural and dairy produce, wine, brandy, and oil. Fishing is extensively prosecuted. Besides the various industries connected with shipbuilding, Havre possesses sugar-refining works, tobacco manufactories, iron foundries, salt works, breweries, vitriol works, and manufactures of *faience*, lace, silk, and paper. It is also much frequented for sea-bathing. The population in 1901 was 120,014.

HAWAIIAN OR SANDWICH ISLANDS, **THE**, a group of eight inhabited and four uninhabited islands in the North Pacific Ocean. From Honolulu, the capital, on Oahu, the distance to San Francisco is 2,100 miles; to Auckland, New Zealand, 3,810 miles; to Sydney, New South Wales, 4,484 miles; to Yokohama, 3,440 miles; to Hongkong, 4,893 miles; to Tahiti, 2,380 miles. The first of the names by which the group is designated above is taken from that of the largest island, Hawaii, and is the name adopted by the inhabitants. The other name was given to it by Captain Cook the discoverer, in honor of the earl of Sandwich, first lord of the Admiralty at the time of the discovery.

These islands, the most important Polynesian group in the North Pacific, were discovered by Captain Cook in 1778. In the following year he was killed by a native when he landed in Kealahakua bay in Hawaii. At the time of Cook's visit each island had its chief. On the death of the chief who ruled Hawaii at that time there succeeded one named Kamehameha, who appears to have been a man of quick perception and great force of character. When Vancouver visited the islands, 1792, this chief being desirous of possessing a vessel on the European model, the keel of one was laid down for him. Ten or twelve years later Mr. Turnbull found him with twenty vessels of from twenty-five to fifty tons which traded among the islands, and he afterward purchased others from foreigners. Having encouraged a warlike spirit in his people and introduced firearms, Kamehameha attacked and overcame the chiefs of the other islands one after another, until he became undisputed master of the whole group. He encouraged trade with foreigners, and derived from its profits a large increase of revenue as well as the means of consolidating his power. He died in 1819, and was succeeded by his son, a mild and well-disposed prince, but destitute of his father's energy. One of the first acts of Kamehameha II. was to abolish *tabu* and idolatry throughout the islands. Some disturbances were caused thereby, but the insurgents were defeated and the peace

of the islands has been scarcely broken since. In 1820 missionaries arrived from America and commenced their labors at Honolulu. A short time afterward the British Government presented a small schooner to the king, and this afforded an opportunity for the Rev. William Ellis, the well-known English missionary, to visit Honolulu, along with a number of Christian natives from the Society Islands. Finding the language of the two groups nearly the same, Mr. Ellis, who had spent several years in the southern islands, was able to assist the American missionaries in reducing the Hawaiian language to a written form. In 1824 the king and queen of these islands paid a visit to England, and both died there of measles. For many years the Hawaiians have continued to advance steadily in intelligence, resources, and civilization, but their progress has been at times interrupted by the conduct of the officers of foreign powers. On one occasion a British officer went so far as to take possession of Oahu and establish a commission for its government; and French officers abrogated the laws, dictated treaties, and by force of arms established the Roman Catholic religion in the country. The act of the British officer was disavowed by his superiors as soon as known; and these outrages led to a representation on the part of the native sovereign to the governments of Great Britain, France, and the United States of America, and the independence of the islands was guaranteed by these powers in 1844. Kalakaua, the late monarch, was elected king by ballot on Lunalilo's death without heirs in 1874. He died in January, 1891, and was succeeded by his sister, who is married to an American.

In 1876 King Kalakaua visited the United States, at which occasion the reciprocity treaty was concluded, admitting Hawaiian raw sugar into the United States and many American products into the Sandwich Islands free of duty. In 1881 Kalakaua made a tour of the world with the object of promoting immigration, but the only practical result of the trip was a convention with Japan, while the king acquired a taste for royal display and extravagance which caused great calamity to his kingdom. A royal palace was built at a cost of \$1,000,000; the government ran into debt to Claus Spreckels, the San Francisco sugar refiner, for money advanced to defray current expenses to the amount of \$750,000. When he refused to lend a larger sum without security, a syndicate of London capitalists was formed, and negotiations for a loan of \$10,000,000 were carried on through an intermediary named McFarlane with an English banker. Walter M. Gibson, a prominent politician, who came to the country as agent of the Mormons for the purchase of land when they thought of emigrating from the United States, became a large land owner, and assumed the part of a champion of the rights and interests of the native race. This man succeeded in being elected into the new ministry which at the time of the loan transaction was about to be formed. The loan act was passed, and received the signature of the king. The legislature, composed for the most part of Kanakas elected by corrupt means, passed also an appropriation bill amounting to \$4,552,477, the revenue being estimated at \$2,839,924 which was greatly in excess of the probable yield. This act and the ever-increasing prodigality of the king roused the anger of the white population who pay the bulk of the taxes. The Americans especially who had been instrumental in developing the resources of the country and possessed the main commercial interests, showed openly their dissatisfaction at the state of affairs, and as there was no change to be expected at the hands of Gibson, who, relying upon the support of the natives, treated the white population with contempt, revolutionary plans

were discussed. At this stage of affairs a scandal transpired which afforded a pretext for action. A Chinese planter and mill owner received from the king a license for the opium trade and paid as remuneration for this royal favor a large sum of money. Having paid the agreed \$60,000, he learned to his grief that the ever-needy king had granted the license to another celestial who had agreed to share the profits with the monarch. When the deceived Chinese went to the king to demand his money back, Kalakaua told him that he had made it by smuggling, and it had now come to the rightful owner.

The white residents of the capital laid their plans of revolution with deliberation, and on June 25, 1887, they took possession of the city. Kalakaua died in San Francisco in 1891 and was succeeded by his sister, Princess Liliuokalani; in 1893 she was deposed and in the following year a republic was proclaimed. In 1898, Hawaii was annexed to the United States, and in 1900 it was erected into a territory of that Power. It was given a legislature of two Houses and has a representative in the national congress.

The area of the inhabited islands is as follows: Hawaii, 4,210 square miles; Maui, 760 square miles; Oahu, on which the capital Honolulu is situated, 600 square miles; Kauai, 500 square miles; Molokai, 270 square miles; Lanai, 150 square miles, and Niihau, 97 square miles. Kahoolawe has an area of 63 square miles. The average number of persons to the square mile was in 1900 23.8. The pop. in 1900 of the various islands was: Oahu, 58,504; Hawaii, 46,803; Kauai and Niihau, 20,734; Maui, 25,416; Molokai and Lanai, 2,504. The population of the islands at the time of the late census, June 1, 1900, was 154,001, an increase of 41.2 per cent since 1896. There were 29,834 natives, 25,742 Chinese, 28,533 whites, 62,122 Japanese, and 956 others. The white population embraced 4,066 Americans, 1,282 English, 1,600 Germans, 192 French, 15,377 Portuguese, 778 of other nationalities, and 2,040 children of foreigners born in the country. Of the 5,410 immigrants, in 1885, 3,108 came from China, 1,961 from Japan, the importation of laborers from the latter country being encouraged at that time by the government, the Chinese laborers who were formerly brought to cultivate the sugar plantations having proved objectionable. About 10,000 Portuguese from the islands of St. Michael's and Madeira have been imported for the same purpose. In 1886 there were 3,725 arrivals and 2,189 departures. A strange feature is the very stringent passport law, no person after a month's residence being permitted to leave the kingdom without a passport, which cannot be granted to any one indebted to the government or to any private individual, or to a defendant in a criminal or civil suit, or to any applicant against whom complaint is made that he is leaving without providing for the maintenance of his family. The population was probably 200,000, when Captain Cook discovered the islands, but within a century the indigenes have decreased to their present number.

The natives belong to the Malayo-Polynesian race. Their reddish-brown skin has been compared to the hue of tarnished copper. The hair, usually raven black, is straight or at most wavy; the beard is thin, the face broad, the profile not prominent, the nose rather flattened, and the lips thick. The bulk of the population are of moderate stature, but the chiefs and the women of their families are remarkable for height.

In the former state of society the habits of the people were extremely licentious; men were living with several wives, and women with several husbands. Female virtue was an unknown thing, and there is no native word for it. This state of things has, however, been greatly altered by the exertion of the missionaries.

As regards cannibalism, it appears that the heart and liver of the human victims offered in the temples were eaten as a religious rite, and that the same parts of any prominent warrior slain in battle were devoured by the victor chiefs in the belief that they would thereby inherit the valor of the dead man. When, on the death of the great warrior Kamehameha I., the chiefs assembled to deliberate what should be done with his body, one suggested that they should eat it, but this did not find favor with the others.

The Hawaiians are a good-tempered, light-hearted, and pleasure-loving race. They have many games and sports, and the women spend much time in making flower garlands. Both sexes are passionately fond of riding, almost every one being in possession of a horse. They delight to be in the water, and swim with remarkable skill and ease. In the exciting sport of surf swimming, which always astonishes strangers, they balance themselves while standing or sitting on a small board which is carried landward on the curling crest of a great roller.

The language is a branch of the widely-diffused Malayo-Polynesian tongue; and Hawaiians and New-Zealanders, although occupying the most remote regions north and south at which any of their race have been found, can understand each other without much difficulty. This language is soft and harmonious, being highly vocalic in structure.

The native dwellings are constructed of wood, or more frequently are huts thatched with grass at the sides and top. What little cooking is undertaken is done outside. The oven consists of a hole in the ground in which a fire is lighted and stones made hot; and the fire having been removed, the food is wrapped up in leaves and placed in the hole beside the hot stones and covered up until ready.

Leprosy is prevalent among the natives, and the government has established a settlement on the island of Molokai, where all persons found to be affected with the disease are kept entirely isolated from the healthy part of the community. The lepers number about 800.

The pasture lands of Hawaii and some of the other islands are favorable to the breeding of cattle. Sub-tropical plants and shrubs are brought to great perfection on the plains near the sea-level. Sugar is the most valuable crop of the kingdom. In 1884 there were in the islands 30,140 horses, 117,613 cattle, 121,683 sheep, 21,860 goats, 2,942 mules, and 278 asses, besides hogs and a large quantity of poultry. The sugar crop of 1886 was the largest ever obtained, amounting to 115,000 tons. The crop of 1887 was estimated at 100,000 tons. The low price of sugar, and the uncertainty regarding reciprocity with the United States recently led to practical attempts to utilize the other natural resources of the country.

No country in the world has as large a commerce as the Hawaiian Territory, in proportion to its population. The exports for 1885 were about \$125 per head of the population. Most of the foreign trade is in the hands of the United States. In 1886 ninety-four per cent. of the total foreign commerce was with the United States, which imported merchandise of the value of \$4,002,000. Of the exports \$10,324,000 went to the United States, while Germany took \$12,000, and other countries \$4,000. The importation of coin and bullion in 1886 was \$1,142,946, and the exportation \$43,277. The export of sugar increased from 3,006,000 pounds in 1862 to 216,223,000 pounds in 1886. The value of the sugar exports in 1899 was \$21,898,190. The export of rice increased from 111,000 pounds in 1862 to 9,535,000 pounds in 1884, but has since fallen off to 7,367,000 pounds in 1885, and

7,339,000 pounds in 1886. The production of coffee was, in 1900, 2,297,000 pounds from 6,451 acres of land. The export of coffee in 1899 was valued at \$132,347, of rice, \$42,562, and of bananas, \$84,268. There were 58,040 bunches of bananas exported in 1884, 60,046 in 1885, and 45,862 in 1896. The number of hides of cattle and skins of calves and goats exported in 1862 was 68,537; in 1884, 49,306; in 1885, 47,636; and in 1896, 61,740. The official returns for 1900 show a sugar production of 542,098,500 pounds, the value of which was \$19,254,773. This was the greatest crop in the history of the islands. The crop of rice for 1899 was large, though it fell short of the production of the four preceding years. The crop yield of rice in 1899, was over 33 million pounds, valued at \$1,562,051. The entire exports of fresh bananas, of goat-skins, 19,782; hides, 19,045; and sheep-skins, 8,783, were consumed by the United States. The crop of wool, amounting to 474,121 pounds, was exported to England.

When Cook arrived at the islands he found there hogs, dogs, and rats. There is a day-flying bat; a small lizard is found, but no other reptiles. Cattle, goats and hogs at the present day run wild upon the mountains in the larger islands, and do much damage to the woods. As to the birds, fifty-three species have been enumerated by Mr. Sanford Dole, but it is thought that many more species remain to be discovered in the mountain districts.

The ravines and mountain slopes on the windward side of the larger islands contain much forest growth, whilst the leeward uplands and plains are comparatively bare. Among the more remarkable forms are a *Pandanus*, or screw pine, and the *Aleurites*, or candle-nut tree, so named from the natives stringing together the kernels, which are very oily, and so making a candle. Sandalwood, formerly plentiful, has been exhausted. The cocoa-nut palm grows in abundance on the coast.

Though the islands are mountainous, none of the eminences reach the limit of perpetual snow. All the islands are of volcanic origin and are entirely composed of the products of eruption. On one of them (Hawaii) the volcanic forces are still in operation; on all the others they have been quiescent for an indefinite period, and the superficial rocks are in a more or less advanced state of decay.

The Executive power is lodged in a Governor, a Secretary, both appointed by the President, and hold office four years, and the following officials appointed by the Governor, by and with the consent of the Senate of Hawaii: An Attorney-General, Treasurer, Commissioner of Public Lands, Commissioner of Agriculture and Forestry, Superintendent of Public Works, Superintendent of Public Instruction, Auditor and Deputy, Surveyor, High Sheriff, and members of the Boards of Health, Public Instruction, Prison Inspectors, etc. They hold office for four years, and must be citizens of Hawaii.

The ancient idolatrous religion has been abandoned since 1819, and the whole population has embraced Christianity. All forms are tolerated, and at Honolulu there are six churches belonging to the Roman Catholic, Protestant Episcopal, and Congregational communions. The bishop of the Church of England is styled the bishop of Honolulu, and the Roman Catholics have also a bishop. The Congregationalists are most numerous. Originally started by the foreign missionaries, the question of education has been taken up by the government.

The number of merchant vessels entered in 1900 was 665, of 867,905 tons, against 310, of 222,372 tons in 1886; 174 of these vessels sailed under the American

flag. The mercantile marine in 1887 counted fifty-seven vessels, including fifteen steamers. The aggregate tonnage was 12,244.

The budget is voted every year. In that for 1899 the receipts are estimated as follows: Customs, \$1,295,628; internal revenue, \$981,486; taxes, \$1,068,117; total, \$3,345,231.

The expenditures voted under the various heads were (1899) as follows: Public debt, \$260,976; instruction, \$340,073; army, \$37,383; public works, \$372,415; sanitary works, \$246,145; and attorney-general's department, \$308,215; total, \$2,553,727.

By virtue of a law signed on September 1, 1886, a debt of \$2,000,000 was contracted in London at six per cent interest, in order to pay off anterior loans. The bonded debt on July 1, 1900, amounted to \$4,890,351, of which the United States assumed a sum not to exceed four millions.

Only about 100 miles of railroad were in operation in 1901, comprising a line from Mahukona across the district of Kohala, twenty miles in length, and one from Hilo to Waiakea, five miles long, both in the island of Hawaii, and another from the port of Kahulani to Husku and Makawao, on the island of Maui, about seven miles in length. The extension of the line on the island of Hawaii to four times its present length is in contemplation, and a subsidy has been voted by the Legislature.

The first telegraph line, forty miles in length, was opened from Wailuku to Lahaina on Maui in 1878, and has since been extended over the entire surface of the island. There are 100 miles of telegraph on the island of Oahu, and ninety miles between Hilo and Kawaihae on the island of Hawaii, besides lines on the other principal islands. Nearly every house and place of business in Honolulu has a telephone.

Since March, 1901, the Marconi system of wireless telegraphy has been in successful operation between the islands of Oahu, Molokai, Lanai, and Maui, and in May of the year following it was extended to the island of Hawaii.

Honolulu (population, 40,487), the capital of the island group, stands on the southwest coast of Oahu, at the mouth of the valley of Nuuanu, which runs back between tall cliffs to two peaks about 3,000 feet high in the great eastern range of mountains. It is the seat of the central government. See SUPPLEMENTS.

HAWARDEN, a market-town of Flintshire, North Wales, eight miles southwest of Chester, is a clean and tolerably well-built place, situated on an eminence commanding an extensive prospect. It lies in the midst of a coal district, and near it are valuable clay-beds. Coarse earthenware draining-tiles, and fire-clay bricks form the chief manufactures of the district. Population of the township, 6,782; of the parish (including Saltney), 8,683. In the neighborhood is Hawarden Castle, built in 1752, and added to and altered in the Gothic style in 1814; it stands near the ruins of the old castle of that name which was granted by the Conqueror to his nephew Hugh Lupus, and which after many vicissitudes came into the possession of Sergeant Glynn, lord chief-justice of England under Cromwell. On the death in 1874 of Sir Stephen R. Glynn, the last of a line of baronets, the castle passed to his brother-in-law, the eminent statesman Mr. W. E. Gladstone.

HAWES, STEPHEN, a minor English poet of the sixteenth century. Neither the date of his birth nor that of his death has been ascertained.

HAWES, WILLIAM (1785-1846), an English musician of some merit, is remembered chiefly by the fact

that through his instrumentality Weber's *Der Freischütz* was for the first time performed in England. This event took place July 24, 1824, and led eventually to Weber's removal to London.

HAWFINCH, a bird so called from the belief that the fruit of the hawthorn forms its chief food, one of the largest of the Finch family, and found over nearly the whole of Europe, in Africa north of the Atlas, and in Asia from Palestine to Japan. In coloration it bears some resemblance to a Chaffinch, but its much larger size and enormous beak make it easily recognizable, while on closer inspection the singular bill-hook form of some of its wing-feathers will be found to be very remarkable. Though not uncommonly frequenting gardens and orchards, in which as well as in woods it builds its nest, it is exceedingly shy in its habits, so as seldom to afford opportunities for observation.

HAWICK, a municipal and parliamentary borough of Roxburghshire in Scotland, ten miles southwest of Jedburgh, and fifty-three miles south-southeast of Edinburgh, situated on the south bank of the Teviot at its junction with the Slitrig, a wild and irregular stream that flows through the town.

The manufactures of Hawick are mentioned in the burgh records so far back as 1640, but they must have been flourishing for some time before that, as the weavers already formed an important part of the population. The manufacture of tweeds is the most important industry of Hawick. In this branch the annual turn-over is about £800,000; while in the whole woollen trade it is about £2,000,000. The manufacture of hosiery, to which the town owes so much of its prosperity, was introduced in 1771, when four looms, employing six men and five women, produced annually about 2,400 pairs of coarse stockings. Hawick has gradually become the chief seat of this trade in Scotland. Pop. about 18,000.

HAWK, a word of somewhat indefinite meaning, being often used to signify diurnal Birds-of-prey, which are neither Vultures nor Eagles, and again more exclusively for those of the remainder which are not Buzzards, Falcons, Harriers, or Kites. Even with this restriction it is comprehensive enough, and will include more than a hundred species, which have been arrayed in genera, varying in number from a dozen to above a score, according to the fancy of the systematizer. Speaking generally, Hawks may be characterized by possessing comparatively short wings and long legs, a bill which begins to decurve directly from the cere (or soft bare skin that covers its base), and has the cutting edges of its maxilla (or upper mandible) sinuated, but never notched. To these may be added as characters, structurally perhaps of less value, but in other respects quite as important, that the sexes differ very greatly in size, that in most species the irides are yellow, deepening with age into yellow, or even red, and that the immature plumage is almost invariably more or less striped or mottled with heart-shaped spots beneath, while that of the adult is generally much barred, though the old males have in many instances the breast and belly quite free from markings. Nearly all are of small or moderate size—the largest among them being the Gos-HAWK and its immediate allies, and the male of the smallest, *Accipiter tinus*, is not bigger than a Song-Thrush. They are all birds of great boldness in attacking a quarry, but if foiled in the first attempt they are apt to leave the pursuit. Thoroughly arboreal in their habits, they seek their prey, chiefly consisting of birds (though reptiles and small mammals are also taken), among trees or bushes, patiently waiting for a victim to show itself, and gliding into it when it appears to be unwary with a rapid swoop, clutching it in their talons, and bearing it away to eat it in some convenient spot.

In Europe there are two species—first, *A. nisus*, the common Sparrow-Hawk, which has a wide distribution from Ireland to Japan, extending also to northern India, Egypt, and Algeria, and secondly, *A. brevipes* (by some placed in the group *Micronisus*, and by others called an *Astur*), which only appears in the southeast, and the adjoining parts of Asia Minor and Persia. In North America the place of the former is taken by two very distinct species, a small one, *A. fuscus*, usually known in Canada and the United States as the Sharp-shinned Hawk, and Stanley's or Cooper's Hawk, *A. cooperi* (by some placed in another genus, *Cooperastur*), which is larger, and has not so northerly a range. In South America there are four or five more, including *A. tinus*, before mentioned as the smallest of all, while a species not much larger, *A. minullus*, together with several others of greater size, inhabits South America.

HAWKE, EDWARD HAWKE, BARON, an English admiral, was born in 1705. He entered the navy at an early age, and in 1733 became commander of the *Wolf*. In the engagement off Toulon in 1744, he broke from the line of battle in order to engage the *Poder*, and although he succeeded in causing her to strike her colors, his breach of discipline was punished by dismissal from the service. He was, however, almost immediately restored by the king's command, and in 1747 was promoted to the rank of rear-admiral of the white. In October of the same year he was sent in command of a squadron intended to intercept a fleet of merchant vessels bound for the West Indies under a convoy of nine men-of-war, and coming up with them on the 14th of the month near the isle of Aix, he succeeded, after a severe struggle, in capturing six of the men-of-war, but darkness coming on before the close of the contest, the whole of the merchant vessels escaped. For his victory Hawke was created a knight companion of the Bath. In December of the same year he was chosen member of parliament for Bristol. In May, 1748, he became vice-admiral of the blue, and in January, 1755, admiral of the white. In the following year he succeeded Admiral Byng as commander of the fleet in the Mediterranean, but arrived too late to succor Minorca; and in none of the commands which he subsequently held did he have an opportunity of distinguishing himself till 1759, when he took charge of a squadron sent to cruise off Brest. On the morning of November 20th he sighted the French fleet under Admiral Conflans off Belleisle, and notwithstanding that the French, trusting to their knowledge of the rocks and shallows, retired toward the shore, he determined to engage them, which he did with such impetuosity that their fleet was only saved from total destruction by the approach of nightfall. As it was, more than half their vessels were either disabled, captured, or driven on shore. For this brilliant victory, Hawke received the thanks of the house of commons and a pension of £2,000 per annum. In 1765 he was appointed vice-admiral of Great Britain and first lord of the admiralty. In 1776 he was raised to the peerage by the title of Baron Hawke of Towton. He died at Shepperton, Middlesex, October 17, 1781.

HAWKESWORTH, JOHN (c. 1715–1773), an author of the last century, was born in London. In 1744 he succeeded Dr. Johnson as compiler of the parliamentary debates for the *Gentleman's Magazine*. Eight years later he started, in company with Johnson, Bathurst and Wharton, a periodical called the *Advertiser*. In 1761 he published a volume of fairy tales, and an edition of Swift's works and letters, with a life prefixed which Johnson has referred to in highly laudatory terms in his *Lives of the Poets*. The reputation he obtained by these and other works was such

that he was commissioned by Captain Cook to edit his papers relative to his first voyage. The work appeared in 1773 in three volumes, and as a reward of his labors, Hawkesworth received from the government the sum of £6,000.

HAWKINS, SIR JOHN (c. 1532–1595), was born in Plymouth about 1532, and was bred a sailor. Learning that negroes from the coast of Guinea were good merchandise for traffic in the West Indies, he made trial of this in three voyages, the first in 1562, the second in 1564. The third, made in company with young Drake, in 1567, ended in disaster, the story of which is related by Hawkins himself. He was returned member of parliament for Plymouth in 1572; and the next year he was made treasurer and comptroller of the navy. In the expedition against the Armada he was appointed vice-admiral, hoisting his flag on board the *Victory*, and for his services on that occasion he was afterward knighted. His last expedition (1595) was undertaken, once more with Drake, mainly with a view to rescue his son Richard, who three years before had fallen into the hands of the Spaniards off the coast of Quito. It was unsuccessful; and, worn out with fatigue and broken-hearted, he died off Puerto Rico on November 12, 1595. Hawkins was the first to use chain pumps and fighting nettings for ships.

HAWKINS, SIR JOHN (1719–1789), will be permanently remembered as the author of an important work on the history of music.

HAWKWOOD, SIR JOHN (ob. 1394), an English adventurer who attained wealth and renown by his services as a condottiere in the Italian wars of the fourteenth century.

HAWTHORN, *Cratægus*, L., a genus of plants of the natural order *Rosaceæ* and sub-order *Pomeæ*. The common hawthorn, termed also whitethorn, quickthorn, quickset, and May tree, May bush, or May, *C. Oxycantha*, L., is a shrub or small tree having a smooth blackish bark; numerous branches, beset usually with thorns, which represent aborted twigs; alternate, long-stalked, obovate-wedge-shaped, three or five-lobed, incised or serrate smooth leaves; flowers sweet-scented, arranged in corymbs, and having caducous bracts, broad, white, pink, or scarlet petals, and one to three styles; and fruit or "haw" an oblong or nearly globular mealy pome, commonly dark red, but occasionally yellow, black, or even greenish orange or dull white, and of one to two cells. The common hawthorn is a native of Europe as far north as 60½° in Sweden, and of North Africa, Western Asia, and Siberia, and has been naturalized in North America and Australia.

HAWTHORNE, NATHANIEL, author, born in Salem, Mass., July 4, 1804; died in Plymouth, N. H., May 18, 1864. He was of Puritan ancestry, his ancestor, William Hathorne, emigrating from Wiltshire, England, in 1630. His father was a sea captain and died when the boy was four years old. Young Hawthorne was a shy and sensitive child, loving solitude and books, and of delicate health. He was educated at private schools, and in 1821 entered Bowdoin College, from which he graduated four years later. Franklin Pierce, Longfellow, and John S. C. Abbott were among his college mates, and their associations were continued through life. Hawthorne read everything he could get hold of; edited a little weekly paper, and wrote some poor verses and a sketch or two of no great merit while at college. His genius matured slowly and for several years, although he wrote a great deal, it was only to destroy the manuscripts unpublished. In 1826 he issued a novel called *Fanshawe*, which he afterward suppressed. Then he wrote short tales, and sketches for newspapers and magazines, continuing his secluded course of life,

and being little known outside of his country home. In 1830 he published some of his *Twice Told Tales*, and during the next seven years edited a magazine and compiled a *Universal History*, being paid \$100 for the last-named. In 1837 the first series of *Twice Told Tales* was issued at Boston, and reviewed favorably by Longfellow in the *North American Review*. Hawthorne was given a position in the Boston custom-house in 1839, by his old friend Geo. Bancroft, and remained there two years, doing no literary work in that time. The Brook Farm experiment attracted him in 1841, and for some months he was a member of that community, where he acquired the materials for the *Blithedale Romance*. In July, 1842, he married Susan Peabody, of Salem, Mass., and went to live with his bride in the old parsonage at Concord, which he immortalized in his *Mosses from an Old Manse* (1846). In 1846 he was appointed surveyor of the Port of Salem, which position he held three years. In his introduction to the *Scarlet Letter* he gives an interesting account of his life and his associates there. The *Scarlet Letter* was published in 1850, and met with unanimous approval. The first edition of 5,000 copies was exhausted at once, and the book was immediately reprinted in England. The lonely student had found his vocation at last, and with it had found fame. His reputation was enhanced by the publication in the following year of *The House With the Seven Gables* and *The Blithedale Romance*.

Hawthorne was a Democrat in politics, and in August, 1852, published a campaign life of his old college friend, Franklin Pierce. In 1853 President Pierce repaid the service by the appointment of his biographer to the consulate at Liverpool, a lucrative office which afforded Hawthorne the opportunity of studying English life and manners, and of visiting the continent of Europe. He wrote while in England *English Note Books*; *Our Old Home*; and *French and Italian Note Books*, and in 1860 published the *Marble Faun* in Boston, with an English edition under the title of *Transformation*. Hawthorne returned to the United States at the beginning of the civil war, and contributed articles to the *Atlantic Monthly* and other magazines. His *Septimius Felton* and *Doctor Grimshaw's Secret*,—the latter unfinished—were not published until after his death. He began to fail in health in the spring of 1864, and died while on a trip to the White Mountains with ex-President Pierce. He was buried in Sleepy Hollow cemetery at Concord, where rest also the ashes of Emerson and Thoreau. Mrs. Hawthorne survived until 1871, and edited her husband's note-books after his death. A daughter, Una, died unmarried; another, Rose, married George Parsons Lathrop; and a son, Julian, born in Boston, June 22, 1846, is well known as a novelist and sketch writer.

HAXTHAUSEN, AUGUST FRANZ LUDWIG MARIA VON, baron of Haxthausen-Abbenburg, was born in 1792. Educated at first at home, he proceeded in 1811 to the school of mining at Klausthal, in the Harz, and after serving in the Hanoverian army in 1813-15, entered the university of Göttingen. In 1836 he received the honorary title of privy state-councillor, and afterward of hereditary chamberlain of the principality of Paderborn. In 1847-48 he sat as a member of the combined diet at Berlin, and afterward of the first Prussian chamber. After traveling through a large part of Europe, Baron Haxthausen retired to his estate. He died at Hanover, January 1, 1867.

HAYDN, JOSEPH, one of the most celebrated composers of the eighteenth century, was born at Rohrau, a village in Lower Austria, March 31, 1732. Having developed an agreeable soprano voice, young Haydn was, by the intercession of the dean of Hainburg, pro-

moted to a post among the choir boys of St. Stephen's cathedral, Vienna, where he remained from 1740-50. As a composer, Haydn was in every sense self-taught. Of his zeal in acquiring information he was in the habit of talking with pride in later years, and several works of sacred music were the first fruit of his early studies. In 1749 or 1750 his beautiful boyish voice changed, and he lost his position accordingly. Being now thrown on his own resources, he had to undergo various forms of musical drudgery, such as giving lessons (at the moderate stipend of two florins per month) and playing in the orchestra at dances and the like. His condition was somewhat improved by his acquaintance with Metastasio, the celebrated operatic poet, in fact the Scribe of the eighteenth century, who introduced him to Señor Martínez, a Spaniard living in Vienna, whose daughter Haydn instructed for several years. It was through Metastasio also that Haydn came into contact with Porpora, the composer, best known as the singing-master of the great Farinelli. An important event in Haydn's life was his acquaintance with Baron Fürnberg, an accomplished amateur, for whose private concerts he wrote his first string quartet, a form of composition in which he earned some of his greatest and most permanent triumphs. It is in the key of B flat, and was followed in rapid succession by seventeen other works of the same class, written during the years 1755 and 1756. To his new protector Haydn also owed his still more important acquaintance with Count Ferdinand Morzin. Count Morzin in 1759 appointed him conductor of his band. The opportunities of hearing his own works performed by competent musicians Haydn did not neglect, and his first symphony in D belongs to the year 1759. Soon afterward Count Morzin was compelled to dissolve his band, but Haydn's position was by this time sufficiently established, and very soon afterward he found employment as second chapel-master to Prince Paul Esterházy, one of the richest Austrian nobles, whose love of art was as great as his wealth. The Esterházy family have been among the foremost patrons of music in Vienna from the days of Haydn to those of Beethoven and Schubert. Prince Paul died in 1762, and left his title and fortune to his brother Nicholas, surnamed the Magnificent. He immediately enlarged his orchestra, and also increased the salaries of its members, including that of Haydn (from 400 to 600 florins), and on the death of his colleague Werner, appointed him first conductor. This position, or at least its title and emoluments, Haydn retained till his death, and his attachment to the Esterházy family remained unchanged by his subsequent fame and fortunes. The events just referred to determined Haydn's career for the next twenty-eight years. During this period he was in the active service of his protector, residing at Esterházy, the splendid country seat of the family, described as a second Versailles, or in Vienna, conducting the orchestra of the prince, and writing for his concerts and theater a number of works, including symphonies, cassationes, quartets, sonatas and numerous vocal compositions, including several operas, none of which, however, had any permanent success. Haydn at an early age became attached to the daughter of a hairdresser, Keller by name, and after her death was persuaded to marry her sister, three years older than himself. The marriage was an unhappy one, and the pair separated soon after their union, Haydn's inflammable heart subsequently causing him more or less serious trouble on more than one occasion. In the meantime the composer's fame had begun to spread from an early period of his career. As early as 1766 a journal speaks of him as the "favorite of the nation," and foreign countries were not slow

in acknowledging his merits. Thus one of his works, *The Seven Words of our Saviour on the Cross*, a series of orchestral interludes for the church service on Good Friday, was written by special invitation for the cathedral of Cadiz. In Paris his works were performed with immense success at the Concert Spirituel, and a single English firm bought the copyright of no less than one hundred and twenty-nine of his works, including eighty-two symphonies. The appreciation of Haydn's work in England led to important results in his latter years. Several pressing invitations to visit that country had been declined by the composer on account of his services being required at Esterházy. But, when in 1790 Prince Nicholas died, and his successor dissolved the orchestra, allowing Haydn a considerable pension, the latter was at last at liberty to accept a munificent offer from Salomon, the violinist and entrepreneur, in whose company he started for London.

Haydn's visit to London was a succession of triumphs. Doctor Burney welcomed him with a laudatory poem; the various musical societies of the metropolis vied for his presence; and on July 8, 1791, he was created doctor of music by the university of Oxford. At court also he was received with distinction. Haydn's engagement with Salomon was to write and conduct at the concerts in the Hanover Square Rooms six symphonies. The symphonies known as the "Salomon Set," comprising some of Haydn's finest instrumental works, are the permanent record of the connection of the two artists. In 1792 Haydn also went to hear the charity children at St. Paul's, whose singing produced on him as deep an impression as it did on Berlioz many years later. Haydn left London in June, 1792, but only to return in January, 1794. In addition to his earlier works six new symphonies were played at the concerts of Salomon, which in the following year were given at the King's Concert-room and terminated on June 1, 1795, when Haydn appeared for the last time in England. He realized \$6,000 by his second English visit, from which he returned to Vienna in the autumn of 1795, to resume once more his functions in the newly organized chapel of Prince Esterházy. The two works on which—apart from his symphonies and sonatas—his immortality must mainly rest, belong to this last epoch of his life. These were the oratorio *The Creation*, and the cantata *The Seasons*. They were both written to German-translations of English libretti, the former being compiled from *Paradise Lost*, the latter from Thomson's *Seasons*. *The Creation* was first performed in public on March 19, 1799, when its success was as immediate as it has since proved permanent. *The Seasons* was begun soon after the completion of *The Creation*, and finished in very little time. Haydn died on May 31, 1809, during the occupation of Vienna by Napoleon's army.

Two of Haydn's brother's acquired a certain amount of celebrity. JOHN MICHAEL HAYDN, born at Rohrau, September 14, 1737, and like his brother a choir-boy at St. Stephen's cathedral, became a prolific and able composer of masses and all kinds of church music. He lived during the greater part of his life at Salzburg, and his name is frequently mentioned in the biography of Mozart. Of his numerous compositions few have been printed. A mass in D is perhaps his masterpiece. He died August 20, 1806. The youngest brother, JOHANN HAYDN (born December 23, 1743, died May 20, 1805), had some reputation as a vocalist, and became, most probably by his brother's intercession, a singer in Prince Esterházy's chapel.

HAYDON, BENJAMIN ROBERT, historical painter and writer, was born at Plymouth, January 26, 1786. At an early date he gave evidence of his taste for study,

which was carefully fostered and promoted by his mother. At the age of twenty-one (1807) Haydon exhibited, for the first time, at the Royal Academy, *The Repose in Egypt*, which was bought by Mr. Thomas Hope the year after. This was a good start for the young artist, who shortly received a commission from Lord Mulgrave and an introduction to Sir George Beaumont. In 1809 he finished his well known picture of *Dentatus*, which, though it brought him a great increase of fame, involved him in a life-long quarrel with the Royal Academy, whose committee had hung the picture in a small side-room instead of the great hall. In 1810 his difficulties began through the stoppage of an allowance of £200 a year he had received from his father. His disappointment was embittered by the controversies in which he now became involved with Sir George Beaumont, for whom he had painted his famous picture of *Macbeth*, and Mr. Payne Knight, who had denied the beauties as well as the value of the Elgin Marbles. *The Judgment of Solomon*, his next production, gained him £700, besides £100 voted to him by the directors of the British Institution, and the freedom of the borough of Plymouth. Haydon joined his intimate friend Wilkie in a trip to Paris; he studied at the Louvre; and, on his return to England, produced his *Christ's Entry into Jerusalem*, which afterward formed the nucleus for the American Gallery of Painting, which was erected by his cousin, John Haviland, of Philadelphia. In 1823 Haydon was lodged in the King's Bench, where he received consoling letters from the first men of the day. While a prisoner he drew up a petition to parliament in favor of the appointment of "a committee to inquire into the state of encouragement of historical painting," which was presented by Mr. Brougham. He also, during a second imprisonment, in 1827, produced the picture of the *Mock Election*, the idea of which had been suggested by an incident that happened in the prison. The king (George IV.) gave him £500 for this work. Among Haydon's other pictures were: 1829, *Eucles*, and *Punch*; 1831, *Napoleon at St. Helena*, for Sir Robert Peel; *Xenophon, on his Retreat with the "Ten Thousand," first seeing the Sea*; and *Waiting for the Times*, purchased by the marquess of Stafford; 1832, *Falstaff*, and *Achilles Playing the Lyre*. In 1834 he completed the *Reform Banquet* for Lord Grey—this painting contained 197 portraits; in 1843, *Curtius Leaping into the Gulf*, and *Uriel and Satan*. When the competition took place at Westminster Hall, Haydon sent two cartoons, *The Curse of Adam*, and *Edward the Black Prince*, but had not the good fortune to gain a prize for either. He then painted *The Banishment of Aristides*, which was exhibited with other productions under the same roof where Tom Thumb was then making his debut in London. The exhibition was unsuccessful; and the artist's difficulties increased to such an extent that, while employed on his last grand effort, *Alfred and the Trial by Jury*, overcome by debt, disappointment, and ingratitude, he wrote "Stretch me no longer on this rough world," and put an end to his existence with a pistol-shot, June 22, 1846, in the sixty-first year of his age.

HAY FEVER, HAY ASTHMA, or SUMMER CATARRH, a term applied to a catarrhal affection of the respiratory mucous membrane occurring in some individuals during the hay season, and generally believed to be due to the inhalation of the emanations from the spring grass. It is an ailment of comparatively rare occurrence. The symptoms are those commonly experienced in the case of a severe cold or influenza, consisting of headache, violent sneezing, and watery discharge from the nostrils and eyes, together with dry hard cough, and occasionally severe asthmatic paroxysms. The attack usually runs 2

course of from two to six weeks, unless cut short by appropriate treatment, to which the complaint is in a considerable measure amenable. There is generally an annual recurrence of the disorder in those liable to it if they are exposed to its exciting cause, namely, the presence of hay. Symptoms of a similar character are produced in certain persons by the aroma of various flowers, by ipecacuanha, and by the odor from cats, dogs and rabbits. The best preventive of or treatment for the disorder is a removal from the neighborhood of the exciting cause. If, however, medical treatment becomes necessary, the best remedies are: for the cough, muriate of ammonia in connection with salycin; made into a pill containing three grains each of the two substances with a half grain of liquid pitch (wood tar), taken by an adult three or four times daily; for asthmatic symptoms the smoking of stramonium (Jamestown weed) leaves is recommended, or the hypodermic injection of opium, or the employment of emetics (which by their nauseating effect relax the pectoral muscles and admit of easier respiration), or extract hyoscyamus (henbane) in small, often repeated doses. For the nasal flow a solution of boracic acid, or sulphate of quinine, or carbolic acid, applied as a nasal douche. In the meantime the general health should be looked to, and administration of quinine and iron or other tonics and antiperiodics is indicated.

HAYLEY, WILLIAM, the friend and biographer of Cowper, was born in Chichester, in England, 1745. Hayley made more than one attempt to succeed as a dramatic author, but first won fame by his political *Essays on Painting, History, and Epic Poetry*, and by his poem the *Triumph of Temper*. On the death of Warton, Hayley was offered the laureateship, but declined it. In 1792 he made the acquaintance of the poet Cowper; and this acquaintance ripened into a friendship which remained unbroken until Cowper's death in 1800. Hayley died in 1820.

HAYNE, ROBERT YOUNG, statesman, was born in St. Paul's parish, Colleton district, South Carolina, on November 10, 1791. He studied law at Charleston, S. C., and in his twenty-first year was admitted to the bar there, but in the same year (1812) served for a short time as a soldier in the war with Great Britain. Returning to practice in Charleston, Hayne was elected a member of the State legislature in 1814, and four years later became speaker. Shortly afterward he accepted the post of attorney-general for his native State, though he declined the same office for the United States. On being elected a senator of the United States, Hayne at once showed himself an active foe to protective legislation, and vigorously combated the tariffs of 1824 and 1828. A bill having been passed in 1832 removing the duty from those imports only which were not in competition with home manufactures, the State of South Carolina passed an ordinance nullifying the bill, on the ground that it was unconstitutional. President Jackson denounced this proceeding, and South Carolina appointing Hayne governor, was preparing to defend its position by arms when congress made the desired change in the tariff, and South Carolina repealed its act. Hayne, on retiring from the governorship in 1834, was elected mayor of Charleston, and continued to take an active interest in public affairs till his death at Asheville, N. C., September 24, 1840.

HAYTER, SIR GEORGE (1789-1871), principal painter in ordinary to the queen, was the son of a drawing master and teacher of perspective who published a well-known introduction to perspective and other works. He painted various works on a large scale of a public and semi-historical character, but essentially works of portraiture; such as *The Trial of Queen Caroline* (189 likenesses), *The Meeting of the First Reformed Par-*

liament, now in the National Portrait Gallery, *Queen Victoria Taking the Coronation Oath* (accounted his finest production), *The Marriage of the Queen* and the *Trial of Lord William Russell*.

HAYTI, or HAÏTI, the largest island of the West Indian group, with the exception of Cuba. It is 400 miles long, and from 60 to 150 miles in width. The island is divided into two governments, that of Hayti in the west, and Santo Domingo (q.v.) in the east. Hayti contains about 10,204 square miles, and has a population of nearly a million, almost all negroes. It is a mountainous country, well watered and heavily timbered. The climate is tropical and unhealthy, and the soil is fertile. The rainy season covers May and June. The chief occupation of the inhabitants is agriculture, mining being neglected, although various minerals are found. Coffee, sugar and lumber, principally mahogany and logwood, are exported. There is little trade, and the condition of the people is degraded. Port-au-Prince is the capital, and there are few other cities of any importance.

Hayti was discovered by Columbus in 1493, and the Spaniards made on its northern coast the first permanent colony of Europeans in the New World. In 1665 France obtained a foothold on the island. In 1800 the French were driven out by the blacks, and Hayti became a republic. Revolutions and military pronunciamientos followed, and, in 1849, an empire was constituted, which again gave place to a republic in 1858. There is now an elective president, with almost despotic powers, and a national assembly, consisting of a senate and house of representatives. The republic is deep in debt, and its annual expenditures exceed its receipts. The established religion is Roman Catholic, but other creeds are tolerated.

HAYWARD, SIR JOHN (c. 1560-1627), one of the earliest writers of English history as distinguished from the old chroniclers, was born near Felixstow on the coast of Suffolk. In 1599 he published *The First Part of the Life and Raigne of King Henrie the III., extending to the end of the first year of his raigne*, which, from its dedication to the earl of Essex, and a passage it contained on hereditary rights, led to the author's imprisonment by Elizabeth.

HAZARA, or HUZARA, a British district in the lieutenant-governorship of the Punjab, India. The area is 2,771 square miles. Population, 400,000. The district forms a wedge of territory extending far into the heart of the outer Himalayan range, and consisting of a long narrow valley, shut in on both sides by lofty mountains, whose peaks rise to a height of 17,000 feet above sea level. The district is well watered by the tributaries of the Indus, the Kunhâr, which flows through the Khâgân Valley into the Jhîlam (Jhelum), and many rivulets. Throughout the scenery is picturesque.

HAZARAS. See **AFGHANISTAN**.

HAZARD, a game played with dice. The player or "caster" calls a "main" (that is, any number from five to nine inclusive). He then throws with two dice. If he "throws in," or "nicks," he wins the sum played for from the banker or "setter." Five is a nick to five. six and twelve are nicks to six, seven and eleven to seven, eight and twelve to eight, and nine to nine. If the caster "throws out" by throwing aces, or deuce, ace (called crabs), he loses. When the main is five or nine the caster throws out with eleven or twelve; when the main is six or eight he throws out with eleven; when the main is seven he throws out with twelve. If the caster neither nicks nor throws out, the number thrown is his "chance," and he keeps on throwing till either the chance comes up, when he wins, or till the main comes up, when he loses. When a chance is thrown, the

"odds" for or against the chance are laid by the setter to the amount of the original stake.

HAZÁRIBÁGH, a British district in the lieutenant-governorship of Bengal, India, is bounded on the north by the districts of Gayá and Monghyr, on the east by the Santál Parganá and Mámbhum districts, on the south by Lohárdagá, and on the west by Lohárdagá and Gayá; it forms the northeast portion of the Chutiá Nágpur division, and has an area of 7,020 miles, and a population of 800,000. A high central plateau occupies the western section, the surface of which is undulating and cultivated; a lower and more extensive plateau stretches along the north and eastern portions; to the north, the land is well cultivated, while to the east the country is of a more varied character, the elevation is lower, and the character of a plateau is gradually lost; the central valley of the Dámodar river occupying the entire southern section. Indeed, although the characteristics of the district are rock, hill, and wide-spreading jungle, fine patches of cultivation are met with in all parts, and the scenery is generally pleasing and often picturesque.

HAZÁRIBÁGH, the chief town and administrative headquarters of the above district, is picturesquely situated on the high central plateau of the district, at an elevation of 2,000 feet above the sea-level, and in the midst of a group of conical hills. Population about 15,000.

HAZEBROUCK, a town of France, capital of an arrondissement of the same name in the department of Nord, is situated on the Bourre, thirty-two miles west-northwest of Lille. Population, 7,000.

HAZEL, a genus of shrubs or low trees of the natural order *Cupuliferae* and sub-order *Coryleæ*. The common hazel is distributed throughout Europe, in North Africa, and in Central and Russian Asia, except the northernmost parts. It is commonly found in hedges and coppices, and as an undergrowth in woods, and reaches a height of some twelve feet; occasionally it may attain to thirty feet. The bark of the older stems is of a bright brown, mottled with gray; that of the young twigs is ash-colored, and glandular and hairy. The leaves are alternate, from two to four inches in length, downy below, roundish-cordate, pointed, and shortly petiolate; occasionally they are found with the margins coherent at the base, or with the disk so depressed as to form a pitcher-like structure. In autumn the rich yellow tint acquired by the leaves of the hazel adds greatly to the beauty of landscapes. The flowers are monoecious, and appear in February or March, before the leaves, and sometimes in October. The cylindrical, drooping, and yellow male catkins are one to two and one-half inches in length, and occur two to four in a raceme; when in unusual numbers they may be terminal in position. The female flowers are small, sub-globose, and sessile, resembling leaf-buds, and have protruding crimson stigmas; the minute inner bracts, by their enlargement, form the palmately lobed and cut involucre or husk of the nut. The ovary is not visible till nearly midsummer, and is not fully developed before autumn. The nuts have a length of from one-half to three-quarters inch, and grow in clusters. Double or treble nuts are the result of the equal development of two or all the three carpels of the original flower, of which ordinarily two become abortive. From the light-brown or brown color of the nuts the terms *hazel* and *hazelly*, *i. e.*, "in huc as hazel nuts" derive their significance. The wood of the hazel is whitish-red, close in texture, and pliant, and has when dry a weight of forty-nine pounds per cubic foot. The nuts are also known as filberts.

HAZEL-HEN. See GROUSE.

HAZLETON, a Pennsylvania mining town, is situ-

ated in Luzerne county, in the midst of a great coal-producing region. The principal business of the town is dependent on the coal industry, the Hazleton mines annually yielding over a million tons output. The town has banks, railroads, telegraphs, churches, and higher and lower schools. A Catholic convent and academy are located here. The municipal government of the town is efficiently administered, and most of the modern improvements and appliances of city life obtain. The community is steadily growing in wealth and population, and the town now (1900 census) contains 14,230 people.

HAZLITT, WILLIAM, one of the most eminent of English critics, was born April 10, 1778, at Maidstone, Kent. He was educated privately, and afterward at the Unitarian college at Hackney, where he first began to speculate upon metaphysical subjects. Feeling disinclined to enter the dissenting ministry, he returned to Wem in Shropshire, where his father had in the meantime settled, and there led an idle and desultory life until, about 1802, he determined upon becoming a painter. He commenced the practice of painting in London, where his elder brother had already acquired some reputation as an artist, and soon found his way into literary and artistic circles, becoming especially intimate with Lamb, Hunt, and Godwin. Previously to this he had (January, 1790) been powerfully influenced by Coleridge. His professional painting did not prosper, and little remains of it except a few portraits; but in 1805 he published his *Essay on the Principles of Human Action*, which had occupied him at intervals for six or seven years. In 1807 appeared a useful abridgment of Abraham Tucker's *Life of Nature Pursued*, and a clever but fallacious attempt to invalidate the natural law established in Malthus' *Essay on Population*. After three or four years, during which he almost disappears from observation, he came forward prominently as a writer in the *Examiner* and as a lecturer at the Surrey institution, bringing out in rapid succession his *Round Table*, a collection of essays on literature, men, and manners, his *View of the contemporary English stage*, and his lectures on the poets, the English comic writers, and the dramatic literature of the age of Elizabeth. By these works, together with his *Characters of Shakespeare's Plays* (1817), and his *Table Talk* (1821), his reputation as a critic and essayist will mainly be sustained. The first reception of his admirable essays was by no means in accordance with their deserts. The *Quarterly* attacked him with deliberate malignity, stopped the sale of his writings for a time, and blighted his credit with publishers. He had become estranged from his early friends, the Lake poets, by what he uncharitably but not unnaturally regarded as their political apostasy; as well as by an escapade of his own, obscurely related, but apparently not creditable. His inequalities of temper separated him for a time even from Leigh Hunt and Charles Lamb. Pecuniary anxieties and disappointments may have contributed to hasten his death, which took place on September 18, 1830.

HEAD, SIR EDMUND WALKER, BART., a popular writer on art, was born in 1805 at Wharton Place, near Maidstone in Kent. He was educated at Winchester school and Oriel college, Oxford, and taking his degree with first-class honors in classics, he became in 1827 fellow of Merton college, and in 1834 university examiner in classics. On his father's death, in 1838, he succeeded to the baronetcy as eighth baronet. He procured in 1847 the office of lieutenant-governor of New Brunswick, whence he passed in 1854 to the governor-generalship of Canada, which he retained till 1861. The following year, having returned to England, Head was nominated a civil-service commissioner. In 1857 he

was sworn of the privy council, and in 1860 was decorated as K.C.B., while in the course of his career he received the degrees of D.C.L. at Oxford and LL.D. at Cambridge. He died in London, January 28, 1868.

HEAD, SIR FRANCIS BOND, BART., soldier, traveler, and author, was born in 1793. He served with the Royal Engineers at the battles of Waterloo and Fleurus, and when he retired from the army he had risen to the rank of major. In 1825 he accepted the charge of an association formed to work the gold and silver mines of Rio de la Plata. In connection with this enterprise, he made several rapid journeys across the Pampas and among the Andes, his *Rough Notes* of which, published in 1826, and written in a clear and spirited style, obtained for him the name of "Galloping Head." In 1835 he was appointed governor of Upper Canada, where he manifested similar energy in dealing with the discontent from which the colony was at that time suffering. He resigned his office in 1837, and in recognition of his services he was in 1838 created a baronet. The narrative of his administration in Upper Canada was published by him in 1839. In 1867 he became a privy councillor. He died at Croydon, July 20, 1875.

HEAD, SIR GEORGE, brother of the preceding, was born in 1782. He was educated at the Charterhouse. In 1808 he received an appointment in the commissariat of the British army in the Peninsula, where he was a witness of many exciting scenes and important battles, of which he gave an interesting account in "Memoirs of an Assistant Commissary-General" attached to the second volume of his *Home Tour*, published in 1837. In 1814 he was sent to America to take charge of the commissariat in a naval establishment on the Canadian lakes, and he subsequently held appointments at Halifax and Nova Scotia. Some of his Canadian experiences were narrated by him in *Forest Scenery and Incidents in the Wilds of North America*, published in 1829. In 1831 he received the honor of knighthood. He published in 1835 *A Home Tour through the Manufacturing Districts of England*, and in 1837 a sequel to it, entitled *A Home Tour through various parts of the United Kingdom*. He also contributed several articles to the *Quarterly Review*, and translated *Historical Memoirs of Cardinal Paca*, 1850, and the *Metamorphoses of Apuleius*, 1851. He died in London in 1855.

HEARNE, SAMUEL, an English explorer, was born at London in 1745. In 1768 he was appointed to examine portions of the coast of Hudson's Bay with a view to the improvement of the codfishing, the discovery of the northwest passage, and of certain mines of copper whose existence was asserted by the Indians. His first attempt, upon which he set out on November 6, 1769, was unsuccessful, owing to the desertion of the Indians; and his second, entered upon on February 23, 1770, was by the breaking of his quadrant likewise rendered abortive; but in his third expedition, upon which he started in December, 1770, he was completely successful, as he not only discovered the existence of copper on the banks of what is now known as Coppermine river, but traced the course of that river till it joined the Arctic ocean. After an absence of eighteen months and twenty-three days he arrived at Fort Churchill, of which he was subsequently promoted to be the governor. He returned to England in 1787, and died there in 1792.

HEARNE, THOMAS (1678-1735), an English antiquary, was born at Littlefield Green, in the parish of White Waltham, Berkshire.

HEART, DISEASES OF THE, form a large proportion of the most serious disorders that afflict mankind, in youth as well as in advanced life.

As in former so in recent times the progress made in

the diagnosis of diseases of the heart has been entirely based on physics and on physiology, and the heart is an organ so situated and so connected as to render it singularly amenable to these methods of investigation. Resting on the diaphragm, and projected against the anterior chest-wall, the heart is partly within reach, and is otherwise so completely surrounded on three sides by resonant organs (the lungs) that any change in its position or in its size is readily made out by palpation and percussion, while by listening over the cardiac area—auscultation—we can ascertain whether the valves of the heart remain intact, have an unusual strain thrown upon them, or have been rendered incompetent by disease.

As the four openings of the heart lie so close together that a superficial area of half a square inch includes a part of each, it is only by taking advantage of certain well-known laws regulating the conduction of sound that we are able to differentiate the sounds produced at each of these openings respectively, and to assign to each a definite position on the chest-wall, where it is heard at its maximum intensity. Physiology, on the other hand, teaches us that each individual cardiac pulsation, the time of which is marked for us by that impulse against the chest-wall of which we are all more or less conscious, consists of alternate acts of contraction and dilatation affecting the four cavities of the heart. Some of these acts precede this impulse, some accompany it, and others follow it, and the relation of any sound produced within the heart to these physiological acts is termed its rhythm.

The organic perfection of the heart is thus easily determined by ascertaining that it is of a normal size, that its impulse is neither too strong nor too weak, and that its sounds are normal when listened to, each in its own position of maximum intensity. When these conditions are present, any abnormal cardiac phenomena, such as palpitation, irregular action, etc., are to be regarded as entirely due to abnormal innervation, and not to any malformation of the heart. On the other hand, organic imperfection is readily detected by the occurrence of abnormality in the phenomena already referred to, especially if accompanied by a blowing sound, instead of the usual valve sound, in any of the normal auscultatory areas. And an intelligent appreciation of these facts, together with a correlation of the physical with the physiological phenomena, that is, a correct determination of the rhythm of the sounds heard, enables us to ascertain with certainty, not only the valve implicated, but also the mode in which the lesion has affected, or is likely to affect, the heart, and through it the circulation. Having found the heart to be functionally deranged, we have two alternatives presented to us—either the valves are incurably deformed from previous disease, or they are merely functionally imperfect from over-distention of the cardiac cavities, a state of matters which may arise from various causes, and which is always susceptible of great relief and very often of perfect cure.

The great function of the heart is to keep up such a pressure within the arterial section of the vascular canals as will suffice for the maintenance of the circulation and of all the organic functions of the body dependent upon it. The tendency, however, of all the extrinsic forces connected with the circulation is to equalize the blood pressure throughout the vascular system, and so to bring the circulation to a stand-still; and indeed it is in this way that death at last occurs; whether it happen suddenly or slowly the cause is still the same—cessation of the circulation brought about by equalization of the blood pressure throughout the whole of the vascular system, or, as it may be otherwise put, from decline of the arterial (aortic) blood pressure.

Valvular lesions of the heart, however produced, tend, as may be readily understood, to neutralize the cardiac function and to lower the arterial blood pressure, either by permitting an unnatural escape of the blood backward (regurgitation), or by obstructing its onward flow (obstruction). And this action is further intensified by the interference with the cardiac nutrition, which necessarily results, first of all directly, from the heart being flushed with blood at a low pressure, and secondly indirectly, from the imperfect performance of all those functions, such as digestion, etc., upon which the formation of healthy blood depends, arising from the same cause.

Valvular disease thus gives the heart more work to do, while it takes from it the power of doing it, putting the organ in a vicious circle. In this way curable disease if neglected may readily lapse into incurability, while to incurable disease there can be but one ending, though, apart from such accidents as embolism or asystole from violent emotion or exertion, that is neither so sudden nor so speedy as is commonly supposed, and indeed usually occurs from gradual asthenia, often accompanied by dropsy, and preceded by a life of more or less active exertion, averaging in many cases not less than twenty years from the primary onset of the disease. During this comparatively long period the disease may have been entirely mute; that is, the valve lesion has progressed so slowly from its trifling commencement that the residual accumulation in the cavity primarily affected has gone on *guttatim*, and has spread itself backward over the other sections of the circulation in the same gradual manner, the resulting dilatation being so immediately followed by compensating hypertrophy that the sufferer has never been aware of any derangement of his functions. A time comes at last, however, when, from a failure of nutrition due to physical causes, the increase in the heart's bulk ceases to be muscular, it becomes fibrous; then indeed the disease is no longer mute, serious rupture of the compensation sets in, and all that art can do is to make the inevitable declension as gradual as possible. Up to this period any accidental rupture of the compensation, which readily enough occurs from over-exertion, imperfect nutrition from any cause, or from any feverish attack, is as a rule perfectly amenable to appropriate treatment, though the restored compensation is always less stable than it had been previously.

Ruptured compensation is often attended by very alarming symptoms, such as great general dropsy and extreme irregularity of the heart's action, but the true measure of the patient's danger lies less in these symptoms than in the condition of the cardiac muscle, and in the circumstances which threaten asystole, that is, arrest of the heart's action.

If in early times the diagnosis of diseases of the heart was a matter of great difficulty, this seemed of less importance, as their treatment was so hopeless. "A mésure qu'on pénètre," says Senac, "dans les maladies du cœur, la médecine paraît plus stérile; que peut-on espérer des médicaments, par exemple, dans les dilatations du cœur?" (The deeper we penetrate into diseases of the heart the more useless medicines prove. What, then, can we hope from medicine, for example, in dilatation of the heart?) But modern science, which has rendered the heart so accessible from all sides that there is nowadays probably no organ of the body whose diseases can be so readily detected or so accurately discriminated, has not only pointed out the true source of danger in these diseases, but has also put into our hands a remedy by which some are cured who were formerly thought incurable, while many incurables have their downward progress so successfully arrested that they feel themselves to be practically cured. And yet DIGI-

TALIS was all but unknown 100 years ago, while so little was known of its real action—*ratio medendi*—that within the last thirty years a living author wrote that the use of digitalis as a diuretic in heart disease was quite "indefensible," as "the failing heart is absolutely incapable of sustaining the depressing influence of the drug." Nor was this all; many writers gravely claiming that the drug was *cumulative* in its action; i.e., it was retained in the system, and all at once, when a certain stage of its administration had been reached, it exhibited its toxic effects—not only as a result of the doses recently taken, but as the combined effect of recent doses with those taken at a remote period of time. Nowadays we know digitalis to be the only drug that can be relied on for increasing the power of the heart's contractions, and it also slows them—the result being that the blood pressure is increased throughout the whole arterial system, and that, time being given for the heart itself to be flushed with blood at an increased pressure, its nutrition is improved. The heart not only acts more powerfully under the immediate influence of the drug, but it becomes more able to act, so that by and by the drug may be left off; though indeed, should the muscular degeneration determinately threaten a rapid progression, tonic doses of the drug may be safely given daily, for many years continuously, in spite of all our forefathers' croaking as to the dangers of accumulation. But however marvelous the effects of tonic doses of digitalis may be, the virtues of the drug in large doses are even more wonderful in appropriate cases, for by means of large doses the skilled physician has it in his power permanently to contract many dilated hearts, and so to cure what seemed an incurable disease not only to Senac but even to many of his more modern successors. Care should be taken, however, to ascertain the exact nature of the valvular lesion of the heart before digitalis is administered, as it may be seriously doubted, whether in cases of regurgitation digitalis can be justified. This affection, usually due to the tardiness in the closing of the ventricle, thus allowing the blood to recede to the cavity of the heart, would seem to be aggravated by the use of any agent which still further tends to slow the motion of the heart. On the other hand, the advocates of digitalis claim that the propulsive power of the heart is so much augmented that the danger is minimized; the question, however, is an open one. The dose of digitalis is usually from five to twenty drops of the tincture. Sixty drops is the maximum, and is rarely administered.

There are many other drugs employed in the treatment of diseases of the heart, but there is no other deserving of special mention. Other medicines are employed to relieve pain, aid digestion, dispel flatulence, unload the bowels, improve the blood, or simply as general tonics, and may be catalogued as morphia, chloroform, belladonna, pepsine, asafoetida, aloes, rhubarb, iron, etc.

ANGINA PECTORIS is a painful disease of the heart which has been already described. *Palpitation* is an extremely rapid and sometimes forcible action of the heart. *Irregular and Intermittent Action* are sufficiently described by their names; irregular action may be tumultuous or so peculiar as to deserve the name of a veritable *delirium cordis*; intermission consists in the dropping of a beat every second, third, or fourth time, or seldomer. Sometimes the intermission only applies to the pulse, the heart acting regularly, and is caused by that particular systole not being forcible enough to propel the blood to the periphery; occasionally we have two beats of the pulse, and then an intermission, constituting what has been termed a *pulsus bigeminus*, or the rhythm of the intermission may be even more varied. All these forms of perverted

action of the heart may accompany valvular lesions, or may occur in hearts whose valves are sound; the walls of such hearts are, however, almost invariably more or less feeble, imperfectly nourished, and the blood often poor and watery. They are rarely indicative of any real danger, though sufficiently troublesome and alarming to the sufferer; they arise from abnormal innervation; a flatulent distention of the stomach, a crapulous dyspepsia, the abuse of alcohol and tobacco, etc., are frequent sources of nervous heart trouble, so frequent that in some parts where young men most do congregate the tobacco heart especially is quite a proverbial ailment. Overwork, worry, or excess of any kind is sufficient to bring on heart trouble of this character. Fortunately, to a skilled physician there is no difficulty of determining the true nature of these cases, and they are all more or less amenable to appropriate treatment. *Syncope*, or fainting, is an affection somewhat similar to those just described; it essentially consists in an emotional inhibition of the cardiac systole, so that the blood pressure within the brain falls below that necessary for the maintenance of consciousness; as the heart's action fortunately does not in these cases entirely cease, the best plan is to favor the flow of blood to the head by maintaining the sufferer with a lowered and slightly depending head until the effects of the momentary inhibition have passed off. The inflammatory affections of the heart, *Carditis*, *Endocarditis*, and *Pericarditis*, are most important and serious affections. They are mainly rheumatic and gouty in character, and they are to be regarded as varieties of these diseases; the mere fact of their affecting the heart is of but little consequence as to their immediate result, however important it may be and by become from the valvular lesions to which they so often give rise. There are but few exceptions to this rule, and among them are those rare cases in which acute endarteritis blocks the coronary vessels and gives rise to fatal angina. *Fatty Degeneration* of the heart, which bulks so largely in the popular mind as a cause of sudden death, is an almost hypothetical lesion of most infrequent occurrence, probably never found apart from disease of the coronary arteries, impossible of diagnosis, and very rarely of itself proving suddenly fatal.

HEART-BURIAL, or burial of the heart in a place separate from that in which the body is laid, seems to have been once practiced by the ancient Egyptians. In European countries it was most common in the twelfth and thirteenth centuries, though instances have occurred in all centuries down to and including the nineteenth. The practice undoubtedly arose out of the special veneration in which the heart was held as the seat of the affections and of certain of the higher virtues, as courage, piety. Besides the heart, other parts of the body, such as the viscera, were sometimes honored with separate burial. It has been suggested that this distribution of the body for sepulture was prompted by a wish to secure the prayers of more than one congregation for the soul of the deceased. In other instances, where the deceased has died abroad and his heart has been carried home for burial, the motive is simpler to understand. The persons who have been honored with separate burial for the heart have been for the most part men and women of royal birth and ecclesiastics of high rank. Among royal personages may be enumerated Henry I. and Richard I. of England, whose hearts were interred at Rouen; Henry III., whose heart was buried at Pontevraud in Normandy; Eleanor, wife of Edward I., at Lincoln; Edward I. himself whose heart was sent to Jerusalem for burial, as was that of ROBERT BRUCE (*q. v.*); the French kings, LOUIS XII., XIII. and XIV., FRANCIS I. and II., and Henry

II. and III.; the Emperor Leopold of Austria; and James II. of England, whose heart was entombed in St. Mary of Chaillot near Paris. The heart of Anne de Montmorency, constable of France, was interred at Les Célestins; that of Lord Edward Bruce at Culross Abbey in Perthshire, his body in Bergen-op-Zoom in Holland; and that of Sir William Temple at Moor Park near Farnham. The viscera of the popes from Sixtus V. (1590) onward were interred in SS. Vincenzo and Anastasio, the parish church of the Quirinal. In the nineteenth century the best-known cases are those of Daniel O'Connell, the poet Shelley ("*cor cordium*"), and Kellermann, the French marshal. The hearts of the first two were buried in Rome, that of the last on the battlefield of Valmy. The practice was prohibited by Pope Boniface VIII. (1294-1303) under sentence of excommunication; but the prohibition was removed by his successor Benedict XI., at all events so far as the French royal family was concerned. See Pettigrew, *Chronicles of the Tombs* (1857), pp. 249 et seq.

HEARTH-MONEY, an unpopular tax of two shillings levied on every hearth in all houses "paying to church and poor;" first imposed in 1663, and abolished in 1689.

HEART'S CONTENT, a port of Newfoundland, on the east side of Trinity Bay, with 900 inhabitants. Two Atlantic cables land here.

HEAT, the cause of the sensation of warmth, and of a multitude of common phenomena in nature and art. In considering this subject scientifically it is necessary from the outset to discard the ideas conveyed by the popular use of such words as hot and cold. A number of bodies, however different, left for a long enough time in the same room, must, as we shall see further on, acquire the same *temperature*, or become in reality equally warm. Yet in popular language, some, as metals, stones, etc., are pronounced to be cold, and others, as flannel and fur, warm. The touch, then, is *not* a means by which we can acquire any definite idea of the temperature of a body.

Nature of Heat.—A heated body is no heavier than it was before it was heated; if, therefore, heat be a material substance, as it was long considered, it must be *imponderable*. And, in fact, under the name of caloric, it is classed in almost all but modern treatises as one of the family of imponderables. But if it were *matter*, in any sense of the word, its quantity would be unchangeable by human agency. Now we find that there are cases in which heat is produced in any quantity without flame, combustion, etc., as in melting two pieces of ice by rubbing them together, and also cases in which a quantity of heat totally disappears. This is utterly inconsistent with the idea of the materiality of heat. The only hypothesis that at all accords with the phenomena is that *heat depends upon motion of the particles of a body*, being in fact Energy, not Matter; and with this idea we shall start.

Temperature.—When two bodies are placed in contact, heat will in general pass from one to the other, with the effect of cooling the first and warming the second. This process goes on until the two acquire the same temperature. Thus temperature is a condition of a body, determining, as it were, the *head* of the heat which the body contains—to take the obvious analogy of water in a cistern or a mill-pond. In this sense it is analogous also to the pressure of gas in a receiver, or to the potential in an electrified conductor. By the help of the "specific heat" of bodies (which will be treated later) we can determine from their change of temperature how much heat they gain or lose. The scientific or *absolute* measurement of temperature can only be alluded to here. See THERMO-DYNAMICS.

Measure of Heat.—Whether it be a vibration, such as light and sound (as in some cases it certainly is), or consist in independent motions of the particles of a body, leading to a succession of *impacts* on each other and on the walls of the containing vessel (as is almost certainly the case in gases), it is none the less certain that the *amount* of heat in a body is to be measured by the *energy* of moving particles. But as we cannot observe those particles so as to ascertain their vis-viva, we must have as a preliminary some artificial unit in terms of which to measure heat. This will be described later. But in order that this process may be applied we must have some means of measuring the temperature of a body, depending upon an *effect* of heat. Whatever that effect may be, it is obvious that, as the laws of nature are uniform, it will afford us a *reproducible* standard, by which we can estimate at any time and at any place an amount of heat, and compare that amount with another observed somewhere else; just as the French *mètre* is reproducible at any time, being (at least by its original definition) the ten-millionth part of a quadrant of the meridian.

Dilatation or Expansion.—Now, one of the most general and notable effects which heat produces on matter is to *expand* it. The length of a metallic bar varies with every change of temperature, and is ever the same at the same temperature. The fixing of the tire of a cart-wheel is a very good instance. No hammering could fit an iron hoop so tightly on the wood-work of the wheel as does the simple enlarging of the tire by heat, and its subsequent contraction by cold. It is thus possible to *slip* it on, and an enormous force is secured to bind the pieces together. In almost every kind of structure the expansion and contraction from changes of temperature require to be guarded against. In the huge iron tubes of the Britannia Bridge the mere change of the seasons would have produced sufficient changes of length to tear the piers asunder, had each end of a tube been fixed to masonry. Watches and clocks, when not compensated, go faster in cold weather, and slower in hot, an immediate consequence of the expansion or contraction of their balance-wheels and pendulums.

If a flask *full* of water or of alcohol be dipped into hot water or held over a lamp, the flask is heated first, and for a moment appears not quite full, but as heat reaches the liquid it expands in turn, and to a greater degree than the flask, so that a portion of the liquid runs over; a glass shell which just floats in a vessel of water, sinks to the bottom when the water is heated; and as water is gradually heated from below, the hotter water continually rises to the surface. Indeed, if this were not the case, it would be impossible to prevent explosions every time we attempted to boil water or any other fluid. If a bladder, partly filled with air, and tightly tied at the neck, be heated before a fire, the contained air will expand, and the bladder will be distended. As it cools it becomes flaccid again by degrees.

These and like instances are sufficient to show us that in *general* all bodies expand by heat. In order, then, to prepare a reproducible means of measuring temperature, all we have to do is to fix upon a substance (mercury is that most commonly used) by whose changes of volume it is to be measured, and a reproducible temperature, or rather two reproducible temperatures, at which to measure the volume. Those usually selected are—that at which water freezes, or ice melts, and that at which water boils. In both of those cases the water must be *pure*, as any addition of foreign matter generally changes the temperature at which freezing or boiling takes place. Another important circumstance is the *height* of the

barometer. The second reproducible temperature is therefore defined as that of water boiling in an open vessel when the barometer stands at 30 inches. In absolute strictness, this should also be said of the freezing-point, but the effect on the latter of a change of barometric pressure is practically insensible. The practical construction of a heat-measurer or *thermometer* on these principles, the various ways of graduating it, and how to convert the readings of one thermometer into those of another, are described in the article THERMOMETER. In the present article we suppose the Centigrade thermometer to be the one used.

If we make a number of thermometer tubes, fill them with different liquids, and graduate as in the Centigrade, we shall find that, though they all give 0° in freezing and 100° in boiling water, no two in general agree when placed in water between those states. Hence the rate of expansion is not generally uniform for equal increments of temperature. It has been found, however, by very delicate experiments, which cannot be more than alluded to here, that mercury expands *nearly* uniformly for equal increments of temperature. However, what we sought was not an *absolute* standard, but a *reproducible* one; and mercury, in addition to furnishing this, may be assumed also to give us approximately the ratios of different increments of temperature.

We must next look a little more closely into the nature of dilatation by heat. And first, of its *measure*. A metallic rod of length l at 0° increases at t° by a quantity which is proportional to t and to l . Hence, k being some numerical quantity, the expanded length $l' = l(1 + kt)$. Here k is called the coefficient of linear dilatation. For instance, a brass rod of length 1 foot at 0° becomes at t° $(1 + .0000187t)$ feet; and here k , or the coefficient of linear dilatation for one degree (Centigrade), is .0000187; or a brass rod has its length increased by about one fifty-three thousandth part for each degree of temperature.

If we consider a bar (of brass, for instance) whose length, breadth and depth are l , b , d —then, when heated, these increase proportionately. Hence,

$$\begin{aligned} l' &= l(1 + kt), \\ b' &= b(1 + kt), \\ d' &= d(1 + kt), \end{aligned}$$

and therefore the volume of, or space occupied by, the bar increases from V or lbd to V' or $l'b'd'$. Hence $V' = V(1 + kt)^3$.

$= V(1 + 3kt)$ nearly, since k is *very small*. Therefore we may write $V' = V(1 + Kt)$, where we shall have as before K , the coefficient of *cubical* dilatation for 1° of temperature. And, as $K = 3k$, we see that, for the same substance, the coefficient of cubical dilatation is three times that of linear dilatation.

In the following table these coefficients are increased a hundredfold, as it gives the proportional increase of length for a rise of temperature from 0° to 100° Centigrade. It must also be remarked that, while the linear dilatation of solids is given, it is the cubical dilatation of liquids and gases which is necessarily given. Moreover, as the latter are always measured in glass, which itself dilates, the results are only *apparent*; they are too small, and require correction for the cubical dilatation of glass. This, however, is comparatively very small, and a rough approximation to its value is usually sufficient.

Glass.....	.00086	Water.....	.0432
Iron.....	.00122	Alcohol.....	.116
Zinc.....	.00294	Air.....	.3665
Mercury.....	.01803	Hydrogen.....	.3668

There is one specially remarkable exception to the law that bodies expand by heat—viz., that of water under certain circumstances. From 0° (Centigrade),

at which it melts, it contracts as the temperature is raised, up to about 4°C. , after which it begins to expand like other bodies. We cannot here enter into speculations as to the cause of this very singular phenomenon, but we will say a few words about its practical utility. Water, then, is *densest or heaviest* at 4°C. Hence, in cold weather, as the surface water of a lake cools to near 4° , it becomes heavier than the hotter water below, and sinks to the bottom. This goes on till the whole lake has the temperature 4° . As the surface cooling proceeds further, the water becomes *lighter*, and therefore remains on the surface till it is frozen. Did water not possess this property, a severe winter might freeze a lake to the bottom, and the heat of summer might be insufficient to remelt it all.

Specific Heat.—The thermometer indicates the temperature of a body, but gives us no direct information as to the amount of heat it contains. Yet this is measurable, for we may take as our UNIT the amount of heat required to raise a pound of water from 0° to 1° , which is of course a definite standard. As an instance of the question now raised—Is *more* heat (and if so, *how much more*) required to heat a pound of water from zero to 10° than to heat a pound of mercury between the same limits? We find by experiment that bodies differ extensively in the amount of heat (measured in the units before mentioned) required to produce equal changes of temperature in them.

It is a result of experiment (sufficiently accurate for all ordinary purposes) that, if equal weights of water at different temperatures be mixed, the temperature of the mixture will be the arithmetic mean of the original temperatures. From this it follows, with the same degree of approximation, that equal successive amounts of heat are required to raise the same mass of water through successive degrees of temperature. As an instance, suppose one pound of water at 50° to be mixed with two pounds at 20° , the resulting temperature of the mixture is 30° ; for the pound at 50° has lost 20 heat units, while each of the other two pounds has gained 10 such units, transferred of course from the hotter water. Generally, if m pounds of water at t degrees be mixed with M pounds at T degrees (the latter being the colder), and if θ be the temperature of the mixture—the number of units lost by the first is $m(t - \theta)$, since *one* is lost for *each* pound which cools by *one* degree; by and that gained by the second is $M(\theta - T)$, and these must be equal. Hence $m(t - \theta) = M(\theta - T)$; whence,

$$\theta = \frac{mt + MT}{m + M}.$$

But if we mix water and mercury at different temperatures, the resulting temperature is found *not* to agree with the above law. Hence it appears that to raise equal weights of different bodies through the same number of degrees of temperature requires different amounts of heat. And we may then define the *specific heat* of a substance as the number of units of heat (as above defined) required to raise the temperature of one pound of it by one degree.

From the definition of a unit of heat it is at once seen that our numerical system is such that the specific heat of water is unity; and, in general, the specific heats of other bodies are less, and are therefore to be expressed as proper fractions. For example, if equal weights of water and mercury be mixed, the first at 0° , the second at 100° , the resulting temperature will not be 50° (as it would have been had both bodies been water), but $3^{\circ}.23$ nearly; in other words, the amount of heat which raises the temperature of one pound of water $3^{\circ}.23$ is that which would raise that of one pound of mercury $96^{\circ}.77$, or the

specific heat of mercury is one-thirtieth of that of water. The following may be given as instances of the great differences which experiment has shown to exist among bodies in respect of specific heat: Water, 1.000; turpentine, .426; sulphur, .203; iron, .114; mercury, .033.

It is mainly to the great specific heat of water that we are indebted for the comparatively small amount of it required to cool a hot body dropped into it; for its comparatively small loss of temperature when it is poured into a cold vessel; and for the enormous effects of the water of the ocean in modifying climate, as by the Gulf Stream.

It has been found generally that the specific heats of elementary solids are nearly *inversely* as their Atomic Weights. Hence their atoms require the same amount of heat to produce the same change in their temperature. Thus, for simple bodies, we have atomic weights of mercury, 100; its specific heat, .033; product, 3.3; atomic weight of iron, 28; its specific heat, .114; product, 3.2. A similar remark may be made, it appears, with reference to compound bodies of any one type; but, in general, the product of the specific heat and the atomic weight differs from one type to another.

Latent Heat, Fusion, Solution and Vaporization.

—We are now prepared to consider the somewhat complex effects produced by heat on the molecular constitution of bodies; and, conversely, the relation of solidity, fluidity, etc., to heat. All solid bodies (except carbon, which has been softened only) have been melted by exposure to a sufficiently high temperature. The laws of this fusion are:

(1) *Every body has a definite melting point, assignable on the thermometric scale, if the pressure to which it is subjected be the same.*

(2) *When a body is melting, it retains that fixed temperature, however much heat may be supplied, until the last particle is melted.* The last result is most remarkable. The heat supplied does not raise the temperature, but produces the change of state. Hence it seemed to disappear, as far as the thermometer is concerned, and was therefore called *latent* heat.

A pound of water at 79°C. added to a pound of water at 0°C. produces, of course, two pounds of water at $39^{\circ}.5$. But a pound of water at 78°C. added to a pound of ice at 0°C. produces two pounds of water at 0° . Heat, then, has disappeared in the production of a change from solidity to fluidity. And this we might expect from the conservation of ENERGY (*q. v.*), for energy in the shape of heat must be consumed in producing the potential energy of the molecular actions of the separate particles in the fluid. For every pound of ice melted, without change of temperature, 79 units of heat are thus converted into potential energy of molecular separation.

We give a few instances of latent heat of fusion: Water (as above), 79.0; zinc, 28.1; sulphur, 9.4; lead, 5.4; mercury, 2.8.

In law 1 it is mentioned that constancy of pressure is necessary. In fact, the freezing (or melting) point of water is lowered by increase of pressure, while those of sulphur or wax are raised; but these effects, though extremely remarkable, are very small. Most bodies contract on solidifying; but some, as water, cast-iron, certain alloys, etc., expand. Thus a severe frost, setting in after copious rain, splits rocks, etc., by the expansion of freezing water; and thus also we obtain in iron the most delicate and faithful copy of a mold, and in the fusible alloy a clear-cut copy of a type. The modern dynamical theory of heat (thermo-dynamics) enables us to see that a perpetual motion would be procurable if bodies which contract on solidifying had not their melting-point raised by pressure, and vice versa.

Analogous to the fusion of a solid is its *solution* in a liquid, or the mutual conversion into liquids of two solids which are intimately mixed in powder. Here, also, we should expect kinetic energy, in the shape of heat, to be used up in producing the potential energy of the liquid state; and, indeed, such is always the case. Such changes of arrangement destroy heat or produce cold; but this in many cases is not the effect observed, as there is generally heat developed by the *loss* of potential energy if there be *chemical* action between the two substances. Hence, in general, the observed effect will be due to the difference of the heat *generated* by chemical action and that *absorbed* in change of state.

If a quantity of pounded nitrate of ammonia (a very soluble salt) be placed in a vessel, an equal weight of water added and the whole stirred for a minute or two with a test-tube containing water, the heat required for the solution of the salt will be abstracted from all bodies in contact with the solution, and the water in the test-tube will be frozen. In this sense the arrangement is called a *freezing mixture*.

Of course the converse of this may be expected to hold, and latent heat to become sensible when a liquid becomes solid. As an example, when a supersaturated solution of sulphate of soda begins to deposit crystals of the salt with great rapidity the temperature rises very considerably; and it is the disengagement of latent heat that renders the freezing of a pond a slow process, even after the whole of the water has been reduced nearly to the freezing point.

Vaporization.—Almost all that has been said on the subject of fusion is true of vaporization, with the change of a word or two. Thus, however much heat we supply to a liquid, the temperature does not rise above the boiling point. Heat, then, becomes *latent* in the act of vaporization, or rather is *converted into* the potential energy involved in the change of state. It is found by experiment that 540 units of heat (each sufficient to heat a pound of water 1° C.) disappear in the conversion of a pound of water into steam. Hence a pound of steam at 100° C. is sufficient to raise 5.4 pounds of water from zero to the boiling point.

COMMUNICATION OF HEAT.—There are at least three distinct ways in which this occurs, and these we will take in order.

Conduction.—Why is it that, if one end of a poker and of a glass or wooden rod be put into a fire, we can keep hold of the other end of the latter much longer than we can of the former? The reason is that heat is more readily transmitted in the iron from particle to particle than it is in glass or wood. This is conduction. It is to be noticed, however, that in this experiment a great portion of the heat which passes along each rod is given off into the air by the surface. The mathematical theory of conduction has been most exquisitely investigated by Fourier, but on the supposition that the rate at which heat passes from a warmer to a colder portion of a body is proportional to the *difference* of temperature. As most of the experiments which have been made with the object of ascertaining the *conductivity* (not *conductibility*, the erroneous word too commonly in use) of different bodies have been made in this way, it is not surprising that our knowledge on this point is very meager indeed. We know that silver and copper conduct better than most other metals, and that the metals in general conduct better than other solids; but our further information is neither very extensive nor very definite. The first determinations of conductivity which are at all trustworthy are those of Forbes. His method was immensely superior to those of his predecessors. Before we give one or two numerical data,

we must explain what the numbers mean. The following definition is virtually that of Fourier:

The thermal conductivity of a substance is the number of units of heat which pass per unit of surface per unit of time, through a slab of unit thickness, whose sides are kept at temperatures differing by 1° C. Taking the unit of heat as above described, a foot as unit of length and a minute as unit of time, the conductivity of iron is about 0.8, while that of copper varies from 4 to little more than 2. (Very slight impurities affect to a great extent both the thermal and the electric conductivity of copper.) Contrasted with these we find that the conductivity of rocks is very small, ranging from 0.015 to 0.04.

In conjunction with their radiating power (see next section), the conductivity of bodies is most important as regards their suitability as articles of clothing for hot or cold climates, or as materials for building or furnishing dwelling-houses. We need but refer to the difference between linen and woolen clothing, or to the difference (in cold weather) of sensation between a carpet and a bare floor, in order to show how essential the greater or less conducting power of bodies is to our everyday comfort.

Radiation.—By this is understood the passage of heat, not from particle to particle of one body, but through air or vacuum, and even through solid bodies (in a manner and with a velocity quite different from those of conduction) from one body to another. There can be no doubt whatever as to radiant heat being *identical* with light, differing from red light, for instance, as red light differs from blue—*i.e.*, having longer waves than those corresponding to red light. This idea might easily have arisen during the contemplation of a body gradually heated. At first it remains dark, giving off only rays of heat; as its temperature increases it gives us, along with the heat, a low red light, which by the increase of the temperature, is gradually accompanied by yellow, blue, etc., rays, and the incandescent body (a lime-ball, for instance) finally gives off a light as white as that of the sun, and which therefore contains all the colors of sunlight in their usual proportions. In fact there is great reason to believe that the sun is merely a mass of incandescent matter, probably in the main gaseous, and that the radiations it emits, whether called heat or light, merely differ in *quality*, not in *kind*. Taking this view of the subject at the outset, it will be instructive to compare the properties of radiant heat with those of light throughout. It must be understood when we make this comparison that the term *heat* is improperly used in this connection. Radiant heat is not heat in the ordinary sense of the word. It is a form of energy, a *transformation* of the heat of a hot body, and can be transformed into heat again when it is absorbed, but on its passage it is not what we ordinarily understand by the word heat.

Light, then, *moves* (generally) in *straight lines*. This is easily verified in the case of heat by the use of the thermo-electric pile and its galvanometer. Placing the pile out of the line from a source of heat to an aperture in a screen, no effect is observed; but deflection of the needle at once occurs when the pile is placed in the line which light would have followed if substituted for the heat.

A concave mirror, which would bring rays of light proceeding from a given point to a focus at another given point, does the same with heat, the hot body being substituted for the luminous one, and the pile placed at the focus. Heat, then, is *reflected* according to the *same laws* as light. A burning lens gives a capital proof of the sun's heat and light being subject to the same laws of *refraction*. When the solar SPECTRUM (*q.v.*) is

formed by means of a prism of rock-salt (the reasons for the choice of this material will afterward appear), the thermo-electric pile proves the existence of heat in all the colored spaces, increasing, however, down to the red end of the spectrum, and attaining its maximum *beyond* the visible light, just as if radiant heat were (as it *must* be) light with longer waves.

Some bodies, as glass, water, etc., transmit, when in thin plates, most of the light which falls on them; others, as wood, metal, colored glass, etc., transmit none or little. A plate of rock-salt, half an inch thick, transmits 96 per cent. of the rays of heat which fall on it; while glass, even of a thickness of one-tenth of an inch, transmits very little. In this sense, rock-salt is said to be *diathermanous*, while glass is said to be *adiathermanous*, or only partially diathermanous. Most of the simple gases, such as oxygen, hydrogen, etc., and *mixtures* of these, such as air, oppose very little resistance to the passage of radiant heat; but the reverse is in general the case with compound gases. It has recently been asserted that water-vapor in particular is exceedingly *adiathermanous*. The question is one of very considerable difficulty, owing to the fact that it is almost impossible to experiment upon vapor alone. The presence of dust particles always produces deposition of *water*, which is a very good absorber of radiant heat.

But there are other remarkable phenomena of radiant heat which are easily observed, and which have their analogy in the case of light. (1) Unstained glass seems equally transparent to all kinds of light. Such is the case with rock-salt and heat. (2) Light which has passed through a blue glass (for instance) loses far less per cent. when it passes through a second plate of blue glass. Similarly heat loses (say) 75 per cent. in passing through *one* plate of crown-glass, and only 10 per cent. of the remainder (say) in passing through a second. (3) Blue light passes easily through a *blue* glass, which almost entirely arrests red light. So dark heat passes far less easily through glass than bright heat does. These analogies, mostly due to Melloni, are very remarkable.

Again, light can be *doubly refracted*, *plane polarized*, *circularly polarized*. All these properties have been found in radiant heat by Principal Forbes.

The beautiful investigations of Stokes, Balfour Stewart, and Kirchhoff have shown us that bodies which most easily *absorb* light of a particular color give off most freely, when heated, light of that color; and it is easily shown by experiment that those surfaces which absorb heat most readily also radiate it most readily. Thus, it was found by Leslie that when a tinned-iron cube full of boiling water had one side polished, another roughened, a third covered with lampblack, etc., the polished side radiated little heat, the roughened more, while the blackened side radiated a very great quantity indeed. And again, that if we have (say) three similar thermometers, and if the bulbs be (1) gilded, (2) covered with roughened metal, (3) smoked, and all be exposed to the same radiation of heat, their sensibility will be in the order 3, 2, 1. A practical illustration of this is seen in the fact that a *blackened* kettle is that in which water is most speedily made to boil, while a polished one keeps the water longest warm when removed from the fire. Again, if a willow-pattern plate be heated white-hot in the fire, and then examined in a dark room, the pattern will be reversed—a white pattern being seen on a dark ground. It is this law of equality of radiating and absorbing powers that mainly gives rise to the superior comfort of white clothing to black in winter as well as in summer; radiating less in winter, it absorbs less in summer.

Much has been argued about the separate existence of

cold, from such facts as these: A piece of ice held before the thermo-electric pile produces an opposite deflection of the galvanometer to that produced by a hot ball. If a freezing mixture be placed at one focus of a spheroidal mirror, and a thermometer with a blackened bulb at the conjugate focus, the latter will fall speedily, though very far off from the mixture. Now, the true explanation of such observations is to be found in what is called the "Theory of Exchanges," first enunciated by Prévost, and since greatly extended and carefully verified by Stewart, which is to this effect: "Every body is continually radiating heat in all directions, the amount radiated being greater as the temperature is higher." Thus the radiation from a body depends on *itself* alone, the amount absorbed depends on the radiation which reaches it. Hence the apparent radiation of cold in the experiments above mentioned is due to the fact of the pile or thermometer *radiating off more heat than it receives*, as its temperature is higher than that of the freezing mixture to which it is opposed. From this it is evident that any number of bodies left near each other tend gradually to assume a common temperature. By this theory of exchanges we explain the cold felt in sitting opposite an open window in a frosty day, even when there is no draught.

Convection.—A hot body cools faster in a current of air than in a still atmosphere of the same temperature, evidently because fresh supplies of the colder air are continually brought into contact with it. This carrying off of its heat by a stream of air is an example of convection. It is by convection mainly that heat is conveyed throughout liquids and gases. Thus, when a lamp is applied to the bottom of a vessel of water the heat does not diffuse itself in the water as it would (by conduction) in a mass of metal, but the expansion of the heated water at the bottom rendering it lighter, bulk for bulk, than the superincumbent fluid, causes it to rise to the surface; and thus, by convection, the heat is diffused through the mass. Conduction, properly so called, can scarcely be shown, though it really exist, in liquids or gases, on this account. The tremulous appearance of any object as seen by light which passes near a hot surface, as that of a boiler or a red-hot poker, is due to the convection of heat in the air, the warm current refracting light less than does the cold air.

Sources of light may, so far as we know, be ultimately reduced to two: chemical combination and mechanical energy, and indeed, in all probability, the former is only a variety of the immensely different forms in which the latter is manifested.

HEATH, the English form of a name given in most Teutonic dialects to the common ling or heather, but now applied to all species of *Erica*, an extensive genus of monopetalous plants, belonging to the order *Ericaceæ*. The heaths are evergreen shrubs, with small narrow leaves, in whorls usually set rather thickly on the shoots, the persistent flowers have four sepals, and a four-cleft campanulate or tubular corolla, in many species more or less ventricose or inflated; the dry capsule is four-celled, and opens, in the true *Erica*, in four segments, to the middle of which the partitions adhere, though in the ling the valves separate at the dissepiments. The plants are mostly of low growth, but several African kinds reach the size of large bushes, and a Spanish variety, *E. arborea*, occasionally attains almost the aspect and dimensions of a tree.

One of the best known and most interesting of the family is the common heath, heather, or ling, *Calluna vulgaris*. This shrub derives some economic importance from its forming the chief vegetation on many of those extensive wastes that occupy so large a portion of

the more sterile lands of northern and western Europe, the usually desolate appearance of which is enlivened in the latter part of summer by its abundant pink blossoms. When growing erect to the height of a yard or more, as it often does in sheltered places, its purple stems, close-leaved green shoots, and feathery spikes of bell-shaped flowers render it one of the handsomest of the heaths; but on the bleaker elevations and more arid slopes it frequently rises only a few inches above the ground. In all moorland countries the ling is applied to many rural purposes; the larger stems are made into brooms, the shorter tied up into bundles that serve as brushes, while the long trailing shoots are woven into baskets. Pared up with the peat about its roots it forms a good fuel, often the only one obtainable on the drier moors. The shielings of the Scotch Highlanders were formerly constructed of heath stems, cemented together with peat-mud, worked into a kind of mortar with dry grass or straw; hovels and sheds for temporary purposes are still sometimes built in a similar way, and roofed in with ling. Laid on the ground, with the flowers above, it forms a soft springy bed, the luxurious couch of the ancient Gael, still gladly resorted to at times by the hill shepherd or hardy deer-stalker. The young shoots were in former days employed as a substitute for hops in brewing, while their astringency rendered them valuable as a tanning material in Ireland and the Western Isles.

It was until recently supposed that no species of heath existed in America; but of late years isolated plants of ling have been found in various parts of New England, Nova Scotia, and Cape Breton, while it has been stated to occur in some abundance in several places in Newfoundland; probably in distant ages it may have had a wider range on the American continent.

The Cape heaths have long been favorite objects of horticulture. In the warmer parts of Britain several will bear exposure to the cold of ordinary winters in a sheltered border, but most need the protection of the conservatory. They are sometimes raised from seed, but are chiefly multiplied by cuttings "struck" in sand, and afterward transferred to pots filled with a mixture of black peat and sand; the peat should be dry and free from sourness. Much attention is requisite in watering heaths, as they seldom recover if once allowed to droop, while they will not bear much water about their roots; the heath-house should be light and well ventilated, the plants requiring sun, and soon perishing in a close or permanently damp atmosphere; in England little or no heat is needed in ordinary seasons. The European heaths succeed well in English gardens, only requiring a peaty soil and sunny situation to thrive as well as in their native localities: *E. carnea*, *mediterranea*, *ciliaris*, *vagans*, and the pretty cross-leaved heath of boggy moors, *E. tetralix*, are among those most worthy of cultivation. The beautiful large-flowered St. Dabeoc's heath, belonging to the closely allied genus *Menziesia*, is likewise often seen in gardens. The Scottish heather, although in itself an insignificant shrub, is associated largely with Scotch song and story.

HEATHCOAT, JOHN, the author of important inventions for facilitating the manufacture of Buckingham or French lace, was born at Duffield near Derby in 1783. During his apprenticeship to a framesmith near Loughborough, he made an improvement in the construction of the warp-loom, so as to produce mitts of a lace-like appearance by means of it. He diligently prosecuted his experiments, and in 1808 constructed a machine capable of producing an exact imitation of real pillow-lace. Some time before perfecting his invention, which he patented in 1809, he removed to Loughborough, where he entered into partnership with Mr. Lacy, a Nottingham manufacturer; but in 1816 their factory

was attacked by the Luddites and the lace frames destroyed. The damages were assessed at £10,000; but as Heathcoat declined to expend the money in the county of Leicester he never received any part of it. Undaunted by his loss, he began at once to construct new and greatly improved machines in an unoccupied factory at Tiverton, Devonshire, propelling them by water-power and afterward by steam. His claim to the invention of the twisting and traversing lace machine was disputed, and a patent was taken out by a clever workman for a similar machine, which was decided at a trial in 1816 to be an infringement of Heathcoat's patent. He followed his great invention by others of much ability, as, for instance, contrivances for ornamenting net while in course of manufacture, and for making ribbons and platted and twisted net upon his machines, improved yarn spinning-frames, and methods for winding raw silk from cocoons. He also patented an improved process for extracting and purifying salt. And offer of £10,000 was made to him in 1833 for the use of his processes in dressing and finishing silk nets, but he allowed the highly profitable secret to remain undivulged. In 1832 he patented a steam plow, which stood foremost in public estimation until superseded by those of Fowler and others. He died in January, 1861.

HEATING. In temperate latitudes the climate is generally such as to necessitate in dwellings, during a great portion of the year, a temperature warmer than that out of doors, and, similarly, tropical plants growing in temperate climates require artificial heat in the house in which they are preserved. Thus heating is required for health and comfort: the object of the application of science is to obtain these with the greatest degree of economy. In its aspect as to health it may be assumed that no system of heating is advisable which does not provide for a constant renewal of the air in the locality warmed. In climates such as that of the Middle States of North America, the temperature of living rooms should be maintained at from 54° to 68° Fahr. in the daytime; the night temperature may be lower, but should not fall below 40°; and the humidity of the air as measured by the wet and dry bulb thermometers should show a difference of not less than 4° nor much exceeding 8° between the two thermometers, although with an ample supply of air a greater degree of dryness would probably not be found objectionable.

All heating apparatus depends upon the transference of heat from the fire to the various parts of the building which it is intended to warm, and this transfer may be effected by radiation, by conduction, or by convection. The ratio of the emission of heat increases with the temperature. It is thus easier to effect the warming of a given space by means of a highly-heated surface than by a surface emitting a lower temperature.

An open fire acts by radiation; it warms the air in a room by first, warming the walls, floor, ceiling and articles in the room, and these in their turn warm the air. Therefore in a room with an open fire the air of the room is, as a rule, less heated than the walls. In this case the warming of the air depends on the capacity of the surfaces to absorb or emit heat; except that the heat received by the walls may be divided into two parts, one part heating the air in contact with the wall, and the other passing through the wall to the outer surface, where it is finally dissipated and wasted. Fireplaces are sometimes constructed to assist the warming of the air of a room.

In a close stove, heated to a moderate temperature, the heat, as it passes from the fire, warms the surface of the materials which inclose and are in contact with the fire and with the heated gases. The materials next transfer the heat to the outer surface in contact with the

air; and the air is warmed by the agency of this outer surface. If heated to high temperatures a stove gives out radiant heat, which passes through the air to warm the objects on which the rays impinge.

With hot-water pipes, the heat from the water heats the inner surface of the pipe, and this surface transfers its heat to the outer surface through the material of the pipes. The rate at which the heat can pass from the inner to the outer surface, and be thus utilized instead of passing away straight into the chimney, depends on the heat evolved by the fire, on the extent of surfaces exposed to the heat and their capacity to absorb and emit heat, and on the quality of the material between the inner and the outer surface as a good or bad conductor of heat. This passage of heat through a body by conduction varies directly with the quality of material, and with the difference between the temperature of the inner surface exposed to the heat, and the outer surface exposed to a cooling influence, and inversely as the thickness between the surfaces. Other things being equal, copper is a better material than iron for conveying the heat from the fire to water or air; and coverings of brick-work, wood or woollen fabrics are better adapted than iron for retaining the heat. The property which appears more than any other to make materials good non-conductors of heat is their porosity to air, and the retention of the air in their pores.

The direct warming of the air may be effected by stoves with brick or iron flues, or by hot-water or steam pipes. The sizes of the heating surfaces for this object must be proportioned to the volume of air required to be warmed for ventilation, and the degree of heat to be maintained, the thickness of the material, and its capacity for absorbing and radiating heat and for transferring heat from one surface to the other. When a large volume of air is supplied and removed for ventilation, rapidity in transferring the heat from the fuel to the air is an important consideration. Brick stoves and flues are worse conductors of heat than iron stoves or flues, but the surface of a brick stove parts with the heat which reaches it somewhat more rapidly than do the surfaces of an iron flue. The slow conducting power of the material and the greater thickness of a brick stove prevent alternations which may take place in the fire from being felt so much as with iron stoves or flues; and therefore the brick stove warms the air more equably, without sudden variations; the air so warmed is free from objectionable elements; and where they can be conveniently applied, it is advisable to use brick stoves for warming air for ventilating purposes.

With an iron flue pipe from a stove, almost the whole heat which any fuel is capable of developing may be utilized by using a sufficiently long pipe, horizontal for the greater part of its length, to convey the products of combustion to the outer air. The heat given out by a stove pipe varies with the temperature from end to end, being of course greatest at the end next the stove, where the emission of heat is very rapid; and the amount of heat given out per square foot will vary at each point as the distance from the stove increases. The proportions also into which the heat divides itself between radiation and convection vary greatly with the temperature. Thus, with a stove pipe heated at the end nearest the stove to a dull red heat of 1230° Fahr., and of sufficient length to allow the heat to be diminished to 150° at the further end, it would be found that at the stove end of the flue pipe 92 per cent. of the total heat emitted by the pipe is given out by radiation to the walls, and only 8 per cent. to the air; but at the exit end the heat is nearly equally divided, the walls receiving 55 and the air 45 per cent. Taking the whole length of such a pipe, the walls would receive 74 per cent. and the

air 26 per cent. of the heat emitted. But with a flue pipe heated to lower temperatures, the air might receive half the heat or even more. When therefore the object is to heat the walls rather than the air, the temperature of the pipes should be high; and for this purpose stove pipes are more effective than hot-water or low-pressure steam pipes. At high temperatures there will be practically little difference of effect between horizontal and vertical flue pipes, because the heat given out is principally that due to radiation, which is independent of the form and position of the radiant. An adequate proportion of flue pipes to the form and size of the stove, involves a large surface for the flue pipe; with a careful observance of proportion, as much as $94\frac{1}{2}$ per cent. of the heat in the fuel has been utilized.

There are, however, several serious objections to iron stoves, especially for small rooms; a long flue pipe is unsightly, and on that account often inadmissible; iron stoves heat rapidly, and easily become red-hot, and the effect produced therefore is unequal. Carbonic oxide, too, has been found in air warmed by iron stoves very highly heated. It is alleged that highly-heated iron may take oxygen from the carbonic acid in the air in contact with its surface, and thus reduce the acid to carbonic oxide.

Whenever iron stoves are used for heating air, care should be taken to prevent the iron from attaining a high temperature, and with this object all iron stoves should have a lining of fire-brick, so as to prevent the fire from coming in direct contact with the iron; such an arrangement preserves greater regularity in the heating of the air. This object may be also attained by giving the stove a large surface in proportion to the fire by means of flanges or gills to carry off the heat as fast as it is generated. Iron coated with a surface of glazed enamel would enable the heat to pass rapidly from the fire to the surface, while the enamel surface would emit the heat more rapidly than the iron surface.

Hot-water pipes for warming air are free from many of the objections arising from the direct application of heat to iron, because the heat can be regulated with exactness.

A high temperature may be obtained from water without generating steam by heating it under pressure. In Perkin's high-pressure system, a continuous iron tube, about one inch diameter, is filled with water; about one-sixth of the length of the tube is coiled and placed in a furnace, and the remainder, forming the heating surface, is heated by the circulation of the water. At the highest level to which the tube is carried it is enlarged so as to allow of a space for expansion of the heated water equal to 5 per cent. of the contents of the small tube.

Pipes may be heated by either hot water or by steam. The higher the temperature, the greater is the comparative effect in warming air; therefore, with a small heating surface, steam pipes are more efficient than hot-water pipes, and steam at a high pressure more efficient than low-pressure steam. The efficient action of hot-water pipes depends upon the upward flow of the heated and expended water as it passes from the boiler, the passage being made as direct as possible, and so protected as to lose little heat between the boiler and the place where the heat is to be utilized. The return pipe, which brings back the water after it has been cooled down by the abstraction of heat in warming the air, should be passed into the bottom of the boiler as directly and in as uniform a line from the place where the heat has been used as possible. The velocity of flow in the pipes will depend upon the temperature at which the water leaves the boiler, the height to which the heated water has to rise, and the temperature at which it passes down

the return pipe back into the boiler. The efficiency of a hot water apparatus will be regulated by these conditions, by the size of the pipe, and by such other conditions as affect the flow of water in pipes. When the boiler or source of heat is very near the level of the pipes for heating the air, the average temperature which can be obtained in the pipes will be lower than when the vertical column is long. The heating surface must be regulated with reference to this difference of level. It may further be assumed that with small pipes, the temperature being constant, the velocity of flow in the pipe necessary to furnish a given amount of heat will vary in the ratio of the length of the pipe. When the water circulates through the pipes by virtue of the difference of temperature of the flow and return currents only, it is impossible to count upon a greater mean temperature of the pipes than from 160° to 180° , because above that temperature the water in the boiler begins to boil. To obtain a sufficient velocity of circulation for long distances, or with small differences of level, a forced circulation may be resorted to.

The amount of heating surface to be afforded with hot-water pipes depends mainly upon the volume of air to be admitted and removed, and the temperature desired to be maintained, but in any given building there are other circumstances to be taken into account, viz., the position, aspect, subsoil, temperature of locality, thickness of walls, size and form of windows, and other influences affecting the temperature of the incoming air, or causing loss of heat. An empirical rule has been laid down that in a dwelling house, one square foot of heating surface is required for every sixty-five cubic feet of space to be warmed, and in a greenhouse one square foot to every twenty-four cubic feet. This empirical rule does not take into account the sanitary considerations as to the renewal of air.

Steam-heated pipes present important advantages in some cases over hot-water pipes for heating purposes, because of the higher temperature to which the pipes can be raised, their consequent smaller size, and the facility of conveying the heat to a distance. Steam heating may be applied directly; and the waste steam from an engine is also applicable for heating.

The direct application of steam-heating on a large scale has been made at Lockport, N. Y. About 200 houses in the city are heated from a central supply through about three miles of piping, radiating from a boiler-house, which contains two boilers sixteen feet by five feet, and one boiler eight feet by eight feet. These boilers are fired during the winter to a pressure of thirty-five pounds to the inch, with a consumption of four tons of anthracite coal in twenty-four hours. The boiler pressure of thirty-five pounds in winter and twenty-five pounds in summer is maintained through a total length of three miles of piping up to the several points of consumption, where there is a cut-off under the control of the consumers. The first 600 feet of mains from the boilers are four inches in diameter. There are 1,400 feet of three-inch pipes, 1,500 feet of two and a half inch pipes, and 2,000 feet of two-inch pipes. The supply pipes from these mains to the houses are one and a half inches in diameter, and within each house three-fourth-inch pipes are used. In addition to the cut-off tap from the main under the control of the consumer, there is a pressure valve regulated to a five-pound pressure under the control of the company; and beyond this is an ingeniously constructed meter, which indicates, not only the total consumption in cubic feet of steam, but also the quantity of steam in each apartment. At each 100 feet of main an expansion valve, like an ordinary piston and socket, is inserted, allowing an expansion in each section of 100

feet of one and three-fourth inches for the heat at thirty-five-pound pressure. No condensation occurs in the mains. They are covered with a thin layer of asbestos paper next the iron, then a wrapping of Russian felt, and finally manilla paper, and the whole is encased in timber bored out three-quarters of an inch larger than the felt-covered pipes, and laid along the street like gas-pipes. The distribution of heat in the apartments is by means of radiators consisting of inch pipes, thirty inches long, placed vertically either in a circle or as a double row, and connected together at top and bottom, with an outlet pipe for the condensed water, which escapes at a temperature a little below boiling, and is sufficient for all the domestic purposes of the house, or it may be used as accessory heating power for horticultural and other purposes. The steam has also been applied at a distance of over half a mile from the boilers for motive power, and two steam engines of ten-horse and fourteen-horse power are worked from the boilers at a distance of half a mile with but a slightly increased consumption of fuel. The laid-on steam is also used for cooking purposes, for boiling, and even for baking. As in the case of gas supply, the steam supply company lay their pipes up to the houses, the consumer paying for all internal pipes, fittings, and radiators. In a moderately-sized eight-roomed house the expense of these amounted to \$150, and in larger houses with costlier fittings to \$500.

HEAVEN. See ESCHATOLOGY.

HEBBEL, FRIEDRICH, a German poet and dramatist, was born at Wesselburn, Schleswig-Holstein, March 18, 1813. He studied philosophy and history at Heidelberg and Munich. In 1841 he returned to Hamburg, where he published his first tragedy, *Judith*. In a journey which he made to Copenhagen, in 1842, he formed the acquaintance of Thorwaldsen and Oehlenschläger, and acquired the more substantial advantage of a traveling annuity from the king of Denmark. He accordingly visited Paris, after which he went to Italy, where he remained several years, staying principally at Rome, Pisa, and Palermo. Having in the spring of 1846 stopped at Vienna on his way home to Germany, he made the acquaintance of the actress Christine Engenhäus, whom he married in May of the same year. His marriage led him to take up his permanent residence in Vienna, and probably deepened his interest in dramatic composition, which from that time chiefly occupied his attention. He died in 1863. His principal dramas are *Genoveva*, 1843; *Maria Magdalena*, 1844; *Julia*, 1851; *Agnes Bernauer*, 1855; and *Die Nibelungen*, 1862.

HEBE, in Greek mythology, is a personification of the blooming freshness and youth of nature. Originally she appears almost identical with the pure Greek Aphrodite (as distinguished from the Oriental goddess). Hebe is the daughter of Zeus and Hera, as Aphrodite of Zeus and Dione; but Dione and Hera are only two names for the same goddess. Like Aphrodite, Hebe is called the most beautiful of the gods. The meaning of the word Hebe tended to transform the goddess into a mere personification of the eternal youth that belongs to the gods, and this conception is frequently met with. Then she becomes identical with the Roman Juventas, who is simply an abstraction or an attribute of Jupiter Juventas, the god of increase and blessing and youth. Perhaps the most interesting point about Hebe is her connection with Heracles. When he was received among the gods and reconciled to Hera, Hebe was given him in marriage. The apotheosis of Heracles and his marriage with Hebe became a favorite subject with poets and painters.

HEBER, REGINALD (1783-1826), a distinguished prelate and hymn-writer, was born at Malpas in Cheshire, England, in 1783. He early showed remarkable

promise, and was entered in November, 1800, at Brasenose College, Oxford, where he proved a distinguished student, carrying off prizes for a Latin poem entitled *Carmen Seculare*, an English poem on *Palestine*, and a prose essay on *The Sense of Honor*. In November, 1804, he was elected a fellow of All Souls' College; and, after finishing his distinguished university career, he made a long tour on the continent. He was admitted to holy orders in 1807, and was then presented to the family living of Hodnet in Shropshire. In 1809 Heber married Amelia, daughter of Doctor Shipley, dean of St. Asaph. He was appointed Bampton lecturer for 1815, prebendary of St. Asaph in 1817, preacher at Lincoln's Inn in 1822, and bishop of Calcutta in January, 1823. Before sailing for India he received the degree of D.D. from the university of Oxford. In India Bishop Heber labored indefatigably, not only for the good of his own diocese, but for the spread of Christianity throughout the East. Animated by apostolic zeal, he undertook numerous tours in India, consecrating churches, founding schools, and discharging other Christian duties. Such devotion to his work in a trying climate told severely on his health. At Trichinopoly he was seized with an apoplectic fit when in his bath, and expired April 3, 1826.

Heber was a man of profound learning, refined literary taste and great practical energy. As a poet he has attained a high place. His *Palestine* is generally considered the best prize poem ever written at Oxford. Heber's fame rests mainly on his hymns, which, as literary compositions, rank among the best in the English language. Those beginning as follows may be instanced: "Lord of mercy and of might;" "Brightest and best of the sons of the morning;" "By cool Siloam's shady rill;" "God, that madest earth and heaven;" "The Lord of might from Sinai's brow;" "Holy, holy, holy, Lord God Almighty;" "From Greenland's icy mountains."

HEBERDEN, WILLIAM, a practical physician of some celebrity, was born in London in the year 1710. In 1724 he was sent to St. John's College, Cambridge, where he obtained a fellowship about 1730, became master of arts in 1732, and took his degree in physic in 1739. He remained at Cambridge about ten years longer as a practitioner of physic, and gave an annual course of lectures on materia medica. In 1746 he became a fellow of the Royal College of Physicians in London; and two years afterward established himself in London, where he was elected a fellow of the Royal Society in 1760. In 1778 he was made an honorary member of the Royal Society of Medicine at Paris. He died May 17, 1801.

HÉBERT, JACQUES RENÉ (1755-1794), a French revolutionist, surnamed from the newspaper he edited *Le Père Duchesne*, was born at Alençon in 1755. He went at an early age to Paris, where he lost more than one situation through malversation, and was in abject poverty when the occurrence of the French Revolution opened up to him a career in which he obtained considerable temporary success and permanent notoriety. Having shown great readiness and proficiency in a style of writing and of oratory which appealed to the worst feelings of the revolutionary mob, he soon acquired great influence in the clubs, and was chosen to oppose the constitutional paper *Le Père Duchesne* by editing a revolutionary paper of the same name. The scurrilous and extravagant language of the new paper exactly coincided with the sentiments of the class to whom it was addressed, and it contributed not a little to several of the worst and most violent manifestations of the revolutionary spirit. It had a very beneficial influence on the fortunes of its editor, who after August 10, 1792, was one of the chief members of the revolutionary com-

mune, and on September 2d was appointed substitute to the *procureur syndic*. On May 24, 1793, an order was sent out for his arrest by the more moderate party of the commune on the ground that he was plotting their assassination, but on account of a formidable outbreak of the mob he was set at liberty, and when he appeared again at the commune he was presented with a civic crown. Having been appointed a member of the commission to examine Marie Antoinette, he with unsurpassed moral baseness foully accused her of a crime too scandalous to be mentioned. Along with several of his colleagues he invented the worship of the goddess "Reason," and subsequently he organized a party of ultra-revolutionists known as the Hébertists or *enragés*. The faction were, however, arrested by the committee of public safety, and on March 24, 1794, were led forth to execution. Hébert behaved with great cowardice at his trial.

HEBREW LANGUAGE AND LITERATURE. The name *Hebrew* is a transcription of *'ebryd*, the Aramaic equivalent of the original Old Testament word *'ibri*, pl. *'ibrim*, which is the proper Gentile name of the people who also bore the collective name of Israel or Children of Israel. The name of Israel with its sacred associations in the patriarchal history is that by which the Old Testament writers prefer to designate their nation; and this circumstance, combined with the fact that the Sacred Text frequently employs the term Hebrews where foreigners are introduced as speaking or spoken to, has led to the conjecture that the name of Hebrews (men from the other side, *seil*, of the Euphrates) was originally given to the descendants of Abraham by their Canaanite neighbors, and continued to be the usual designation of the Israelites among foreigners. A closer view of the case does not confirm this conjecture. The name of Israel is often found in the Old Testament in the mouth of foreigners, and the whole *usus loquendi* is explained by the observation that the Gentile noun corresponding to the collective "Israel" is regularly "Hebrew" and not "Israelite," the latter word being rare and apparently of late formation. Nor has the word Hebrew been hitherto found in the early monuments of other Eastern nations; for the identification proposed by Chabas, which finds the Hebrews in the hieroglyphic Apurios is more than doubtful. On the other hand the name of Israel appears on the stone of Mesha king of Moab, and perhaps has been deciphered on Assyrian monuments.

The form *'ibri* is, in the language of Semitic grammarians, a relative noun, presupposing the word *'Eber* as the name of the tribe, place, or common ancestor, from whom the Hebrews are designated. Accordingly we find Eber as a nation side by side with Assyria in the obscure poetical passage Num. xxiv. 24, and Eber as ancestor of the Hebrews in the genealogical lists of Gen. x., xi. Here we must apparently distinguish two records. According to Gen. xi. (and Gen. x. 24) Eber is the great-grandson of Shem through Arphaxad and ancestor of Terah through Peleg, Reu, Serug, and Nahor. These are not to be taken as the names of individual men. Several of them are designations of places or districts near the upper waters of the Euphrates and Tigris, and among other circumstances the place at the head of the series assigned to the district of Arrapachitis (Arphaxad), through which a migration from Ararat to the lands occupied by the Semites in historical times would first pass, suggests the probability that the genealogy is not even meant to exhibit a table of ethnological affinities, but rather presents a geographical sketch of the early movement of the Hebrews, who are personified under the name of Eber. If this is so we can hardly venture to assert (with some scholars) that

the author of the list (the Levitical Elohist) extended the name of Hebrews to all descendants of Terah.

When it is recognized that Eber in Genesis is not an actual personage but an ethnological or geographical abstraction, we are thrown back on etymological conjecture as to the origin of the name of Hebrews. Eber means the further bank of a river, from a root meaning to *cross*. Hence in Gen. xiv. 13 the Septuagint renders Abram the Hebrew by "the crosser." Grammatically more accurate, while resting on the same etymology, is the rendering of Aquila, "the man from the other side" of the Euphrates, which is the explanation of Jewish tradition and still generally adopted. It is, however, far from satisfactory, and almost of necessity depends on the theory that the name was fixed upon the Hebrew immigrants by the earlier inhabitants of Canaan.

By the Hebrew language we understand the ancient tongue of the Hebrews in Canaan—the language in which the Old Testament is composed, with the exception of the Aramaic passages. But we do not find that this language was called Hebrew by those who spoke it. It is the *lip*, i.e., speech of *Canaan*, Isa. xix. 18, or, as spoken in Southern Palestine. The later Jews call it the *holy tongue* in contrast to the *profane* Aramaic dialect (commonly though improperly enough called Syro-Chaldaic) which long before the time of Christ had superseded the old language as the vernacular of the Jews. This change had already taken place at the time when the expression "in Hebrew" first occurs (Prologue to Sirach); and both in the Apocrypha and in the New Testament the ambiguous term, naming the language after those who used it, often denotes the contemporary vernacular, not the obsolete idiom of the Old Testament. But the other sense was admissible, and naturally became the prevalent one among Christian writers who had little occasion to speak of anything but the Old Testament Hebrew. In modern usage it is incorrect to call the Jewish Aramaic Hebrew; though uneducated Jews apply the name even to the corrupt German and Spanish jargons which they are accustomed to write and print in Hebrew characters.

Hebrew is a language of the group which since Eichen has generally been known as Semitic, and of which Arabic and Ethiopic (Southern Semitic), the various dialects of Aramaic, and the language of the Assyrian and Babylonian cuneiform inscriptions are the chief representatives. From its geographical position as the language of Palestine between the Aramæans of the north and the Arabs of the south, Hebrew has been called Middle Semitic. Or Aramaic Assyrian and Hebrew may be grouped together as Northern Semitic in contrast to Arabic and Ethiopic. The affinities of the Semitic languages are so close that they may fairly be compared with a sub-group of the Indo-Germanic family—for example, with the Teutonic languages. The fundamental unity of the Semitic vocabulary is easily observed from the absence of compounds (except in proper names), and from the fact that almost all words are derived from their roots in definite patterns (*measures*) as regular as those of grammatical inflexion. The roots regularly consist of three consonants (seldom four or five), the accompanying vowels having no radical value, but shifting according to grammatical rules to express various embodiments of the root idea. The trilateral roots are substantially common to the whole Semitic group, subject to certain consonantal permutations, of which the most important are strikingly analogous to those laid down by Grimm for the Teutonic languages.

Before the rise of comparative philology it was a familiar opinion that Hebrew is the original speech of

mankind. Taken from the Jews, and as already expressed in the Palestinian Targum on Gen. xi. 1, this opinion drew its main support from etymologies and other data in the earlier chapters of Genesis, which, however, were as plausibly turned by Syriac writers in favor of their own tongue. Till quite recently many excellent scholars have claimed for Hebrew the greatest relative antiquity among Semitic tongues. But though Hebrew has by far the oldest literature, this does not prove that its structure comes nearest to the original Semitic language. And it is now generally recognized that in grammatical structure, the Arabic, shut up within its native deserts till the epoch of Islam, preserved much more of the original Semitic forms than either Hebrew or Aramaic. But while Arabic is in many respects the elder brother, it is not the parent of Hebrew or Aramaic. Each member of the group had an independent development from a stage prior to an existing language, though it would seem that Hebrew did not branch off from Aramaic so soon as from Arabic, while in its later stages it came under direct Aramaic influence.

The Hebrew spoken by the Israelites in Canaan was separated only by very minor differences (like those of provincial dialects) from the speech of neighboring tribes. We know this for the Moabite language from the stone of Mesha; and the indications furnished by proper names, as well as the acknowledged affinity of Israel with these tribes, make the same thing probable for Ammon and Edom. More remarkable is the fact that the Phœnicians and Canaanites, with whom the Israelites acknowledged no brotherhood, spoke a language which, at least as written, differs but little from Biblical Hebrew. This observation has been used in support of the very old idea that the Hebrews originally spoke Aramaic, and changed their language in Canaan. But an exacter study of the Phœnician inscriptions shows differences from Hebrew which suffice to constitute a distinct dialect, and combine with other indications to favor the view that the descendants of Abraham brought their Hebrew idiom with them from Haran. In this connection it is important to observe that the old Assyrian, which preceded Aramaic in regions with which the book of Genesis connects the origin of Abraham, is in many respects closely akin to Hebrew. As the origin of Hebrew is lost in the obscurity that hangs over the early movements of the Semitic tribes, so we know very little of the changes which the language underwent in Canaan. The existence of local differences of speech is proved by Judges xii. 6. In general it may be said that the Biblical text supplies inadequate data for studying the history of the language. Semitic writing, especially a purely consonantal text such as the Old Testament originally was, gives an imperfect picture of the very grammatical and phonetic details most likely to vary dialectically or in course of time. The later punctuation (including the notation of vowels), and even many things in the present consonantal text, represent the formal pronunciation of the synagogue as it took shape after Hebrew became a dead language—for even the Septuagint has often a more primitive pronunciation of proper names. This modern system being applied to all parts of the Old Testament alike, many archaisms were obliterated or disguised, and the earlier and later writings present in the received text a grammatical uniformity which is certainly not original.

The Semitic peoples possessed the art of writing and an alphabetical character from a date so remote as to be lost in the mists of antiquity. This character was formerly known as Phœnician, its invention being ascribed to that people. In reality it was the common

property of all Semitic nations between Assyria and Egypt—an alphabetic character in contact on the east and on the west with more complicated syllabic or hieroglyphic systems, from one or other of which it may possibly have been derived.

This ancient alphabet consists of twenty-two consonants. The vowels were supplied by the reader—which is not so difficult in Semitic languages, where vocalization constitutes no difference of root. This old character with its scanty indications of vowels continued to be used by the Hebrews throughout the flourishing period of their literature and for some time after the Exile, till at length they gradually adopted a newer form of letters (the square or, as the Talmud calls it, the Assyrian character) which was developed among the Arameans and spread with the increase of Aramaic influence. Jewish tradition ascribes the introduction of the square character to Ezra; but the Samaritans, who did not receive the Pentateuch from the Jews till about 400 B.C., must have got it in the old letter, which they still retain in a corrupted form. The square letter probably did not prevail till a good deal later, the earliest Jewish inscription in which it appears being of the date 176 B.C., while the coins of Judea retain the old character still later. The transformation was complete before the time of Christ. The later introduction of vowel points and accents belongs to the history of the study of Hebrew as a dead language. The forms of the old Semitic alphabet are most suitable to be cut on stone, and indicate a special adaptation for monumental inscriptions (*cf.* the two tables of the Decalogue). Between the beginnings of such inscriptions and the general use of writing for literary purposes a considerable period might intervene. The earliest products of Hebrew authorship seem to have been lyrics and laws, which would circulate in the first instance from mouth to mouth without the use of written copies. We have notice of early written collections of lyrics prior to our present historical books—*Book of the Wars of Jehovah* (Num. xxi. 14) and the *Book of Jasher* (Josh. x. 13, 2 Sam. i. 18). We have no clue to the age of the former book, but the lines quoted from it are plainly of great antiquity. The *Book of Jasher* is not earlier than the time of Solomon; for a fragment from it referring to the building of the temple has been recovered from the Septuagint of 1 Kings viii. The earliest date of written law books is uncertain. It may fairly be made a question whether Moses left in writing any other laws than the commandments on the tables of stone. Even Ex. xxiv. 4 and xxiv. 27 may in the original context have referred to the ten words alone. It is certain that ancient law was handed down by oral tradition and local custom to a much later date. The prophets frequently allude to the oral decisions of the priests as a source of law, and the practice of appealing to the local customs of certain towns is alluded to in 2 Sam. xx. 18. In like manner the story of the early fortunes of the nation down to the time of David often presents characteristics which point to oral tradition as its original source. Yet written history began comparatively early. A scribe was attached to the royal court from the reign of David downward; and the older parts of the books of Samuel, which must have been written not long after the time of that king (see DAVID), are framed in a masterly style, which shows that the art of composition in prose was already thoroughly understood. So, too, the best written and most brilliant part of the narrative of the Pentateuch—the combined history of the Jehovist and the non-Levitical Elohist—appears to be unquestionably earlier than the rise of prophetic literature in the eighth century B.C. In this narrative—itsself the product of more than one

writer—are included several collections of old laws, so that we have between the time of David and the age of Amos and Hosea a flourishing historical and legal literature, in which and in lyrical collections like the *Book of Jasher* were embodied many poems, legends and other remains, transmitted, whether orally or by writing, from a much earlier date. To the same period may be assigned the most interesting and graphic histories in the book of Kings, the splendid episode of Elijah, and other remains of Ephraïtic history; and to these must probably be added the main stock of the Song of Solomon, though this lyric drama has suffered much from interpolation, and presumably was not written down till a comparatively late date, and from imperfect recollection, so that its original shape is very much lost. It is mainly from the admirable prose narratives, to which nothing in later books can be compared, that we must judge of the first bloom of Hebrew literature under the ancient kingdoms of Judah and Ephraim, before the convulsions that accompanied the advance of Assyria and prior to the influence of written prophecy. That the Hebrews once possessed a poetry of high merit, drawn from the themes of ordinary life, appears, not only from the book of Canticles and such relics as the Song of the Well (Num. xxi. 17, 18), but from the names of popular airs preserved in the titles of the Psalms.

In this earliest period—the age of popular literature, as we may call it, modeled upon the songs and histories that circulated orally through the country—there is a remarkable preponderance of writings connected with the northern kingdom, and these include the narratives that are fullest of human interest and the poetry richest in color and imagination, such as the loves of Jacob and Rachel, the history of Joseph, the life of Elijah, the pictures of nature in the Canticles. The political and social superiority of Ephraim before the conflict with Assyria is reflected in the literature. A new epoch begins with the rise of written prophecy in the eighth century. By this time writing and literary knowledge were widely diffused. Amos, himself an excellent stylist, in whose book only perverse ingenuity can trace marks of rusticity, was a simple herdsman in the wilderness of Judah. Yet it appears that the origin of written prophecy was due less to the spread of education than to the rise of a new school of men whose whole method and aims were in conflict with the official prophetic societies, the unworthy successors of Samuel and Elijah.

In the terrible struggle with Nineveh, when the kingdom of Ephraim perished and Judea seemed lost beyond hope, the new prophecy established a spiritual and intellectual ascendancy which is stamped on the whole literature of the Assyrian and Chaldean periods. In the book of Deuteronomy the ancient ordinances of Israel were rewritten in the prophetic spirit, and the reformation carried out by Josiah on the basis of this book is the decisive proof of the influence of the written word as the organ of prophetic ideas. The earliest written prophecy is nervous rhetoric of the old pregnant Hebrew style interspersed with bursts of song. Even before the Exile this style had undergone a change. Jeremiah was much occupied with the dark problems of providence and the meaning of the sufferings of the faithful in Israel, a topic which goes beyond the sphere of the earlier prophecy, but forms a chief theme of Isa. xl.–lxvi., and from a different point of view is taken up and discussed in the book of Job. The last named book is the highest utterance of another characteristic form of Hebrew literature, the *Chokma*, that is, wisdom or practical philosophy in parable, or epigrammatic or poetic form. The earliest distinct

trace of literary cultivation of this philosophy, which from its nature must at first have passed unwritten from mouth to mouth, is the collection of ancient proverbs by scholars in the service of Hezekiah.

The decadence of prophecy and the synchronous systematization of the ceremonial law on lines first drawn by Ezekiel mark the commencement of the third and last period of Hebrew literature. The freshest and best products of this period are the post-Exile psalms, the hymns of the second temple, which occupy a large part of the Psalter, and, though generally inferior to the older lyrics in the highest poetical qualities, are often full of the charm of genuine feeling and sweet utterance, and sometimes rise to a sublime energy of devotion and faith. With these psalms the graceful prose style of Ruth has a natural affinity. The other writings of the last age are on the whole much inferior. As the language decayed, the graces of the older prose style were lost. The memoirs of Ezra and Nehemiah, the colorless narrative of the Chronicles, and even the book of Esther, are singularly destitute of literary merit.

HEBREWS, EPISTLE TO THE. The New Testament writing usually known under this name, or less correctly as the Epistle of Paul the Apostle to the Hebrews, bears in the oldest MSS. no other title than the words, "To the Hebrews." This brief heading embraces the whole information as to the origin of the epistle, on which Christian tradition is unanimous. Everything else—the authorship, the address, the date—was unknown or disputed in the early church, and continues to form matter of dispute in the present day. But as far back as the latter part of the second century the designation of the epistle "to the Hebrews" was acknowledged alike in Alexandria, where it was ascribed to Paul, and in Carthage, where it passed by the name of Barnabas, and no indication exists that it ever circulated under another title. At the same time we must not suppose, as has sometimes been done, that the author prefixed these words to his original manuscript. The title says no more than that the readers addressed were Christians of Jewish extraction, and this would be no sufficient address for an epistolary writing directed to a definite circle of readers, a local church or group of churches to whose history repeated reference is made, and to which the author had personal relations. The original address, which according to custom must have stood on the outside of the folded letter, was probably never copied, and the early and universal prevalence of the present title, which tells no more than can be readily gathered from the epistle itself, seems to indicate that when the book first passed from local into general circulation its history had already been forgotten. The early Roman Church, where the epistle was known about the end of the first century, and where, indeed, the first traces of the use of it occur, had nothing to contribute to the question of authorship and origin except the negative opinion that the book is not by Paul. Caius and the Muratorian fragment reckon but thirteen epistles of Paul; Hippolytus (like his master Irenæus of Lyons) knew our book, and declared that it was not Pauline. These facts can hardly be explained by supposing that at Rome during the second century the book had dropped out of notice, and its history had been forgotten. Clement, Hermas, Hippolytus form a tolerably continuous chain, and the central Church of Rome was in constant connection with provincial churches where, as we shall presently see, the epistle had currency and reputation. Under these circumstances an original trustworthy tradition could hardly have been lost, and it must appear highly questionable whether the author and address of the book were known at Rome even in the

time of Clement. The earliest positive traditions of authorship to which we can point belong to Africa and Egypt, where, as we have already seen, divergent views were current by the end of the second century. The African tradition preserved by Tertullian, but certainly not invented by him, ascribes the epistle to Barnabas. Direct apostolic authority is not, therefore, claimed for it; but it has the weight due to one who "learned from and taught with the apostles," and we are told that it had more currency among the churches than "that apocryphal shepherd of the adulterers" (the Shepherd of Hermas). This tradition of the African Church holds a singularly isolated position. Later writers appear to know it only from Tertullian, and it soon became obsolete, to be revived for a moment after the Reformation by the Scottish theologian, Cameron, and then again, in our own century by the German critics, among whom at present it is a favorite view. Very different is the history of the Egyptian tradition, which can be traced back as far as a teacher of the Alexandrian Clement, presumably Pantenus. This "blessed presbyter," as Clement calls him, sought to explain why Paul did not name himself as usual at the head of the epistle, and found the reason in the modesty of the author, who, in addressing the Hebrews, was going beyond his commission as apostle to the Gentiles. Clement himself takes it for granted that an epistle to the Hebrews must have been written in Hebrew, and supposes that Luke translated it for the Greeks. Thus far there is no sign that the Pauline authorship was ever questioned in Alexandria. Origen rests on the same tradition, which he refers to "the ancient men." But he knows that the tradition is not common to all churches. He feels that the language is un-Pauline, though the admirable thoughts are not second to those of the unquestioned apostolic writings. And thus he is led to the view that the ideas were orally set forth by Paul, but that the language, arrangement, and some features of the exposition are the work of a disciple. According to some this disciple was Clement of Rome; others named Luke; but the truth, says Origen, is known to God alone. From the time of Origen the opinion that Paul wrote the epistle became more and more prevalent in the East. In the West this view was still far from established in the fourth century. But it gained ground steadily; even those who, like Jerome and Augustine, knew the variations of tradition, were unwilling to press an opposite view; and in the fifth century the Pauline authorship was accepted at Rome, and practically throughout Christendom, not to be again disputed till the revival of letters and the rise of a more critical spirit.

As criticism strengthened its arguments, theologians began to learn that the denial of tradition involves no danger to faith, and at the present moment scarcely any sound scholar will be found to accept Paul as the direct author of the epistle, though such a modified view as was suggested by Origen still claims adherents among the lovers of compromise with tradition.

The arguments against the Alexandrian tradition are in fact conclusive. It is probably unfair to hamper that tradition with Clement's notion that the book is a translation from the Hebrew. But just as little can the Greek be from Paul's pen. The un-Pauline character of the style, alike in the words used and in the structure of the sentences, strikes every scholar as it struck Origen and Erasmus. The type of thought is quite unique. The theological ideas are cast in a different mold; and the leading conception of the high priesthood of Christ, which is no mere occasional thought, but a central point in the author's conception of Christianity, finds its nearest analogy not in the Pauline epistles, but in John. The Old Testament is cited after the Alexandrian trans-

lation more exactly and exclusively than is the custom of Paul, and that even where the Hebrew original is divergent. Nor is this an accidental circumstance. There is every appearance that the author was a Hellenist whose learning did not embrace a knowledge of the Hebrew text, and who derived his metaphysical and allegorical method from the Alexandrian rather than the Palestinian schools.

But all investigation regarding the person of the author only permits us to say that he was a man of the first intellectual mark and of Alexandrian culture, whose home and work lay mainly among Jewish Christians, but who was at the same time associated with the Pauline circle. Of the names offered to us in other New Testament writings, Barnabas and Apollos seem the most likely, and Barnabas will claim the preference if we are entitled to give any weight to tradition. Either name would go well with the Alexandrian address. Apollos was an Alexandrine Jew. Barnabas was of Cyprus, always closely connected with Egypt; and the tradition which connects his relative and associate Mark with the Church of Alexandria is as old as the second century.

HEBRIDES, THE, or WESTERN ISLES OF SCOTLAND, is a name sometimes applied collectively to all the islands on the west coast of Scotland, but seldom including Bute, Arran, and the other islands situated in the Firth of Clyde. The group is usually divided into the Outer Hebrides, or Long Island, and the Inner Hebrides. The former division embraces the Lewis, Harris, North and South Uist, Benbecula, Barra, and a number of small islands, the whole length of this group, from Barra-Head to the Butt of Lewis, being about 130 miles. The Inner Hebrides include Islay, Skye, Mull, Jura, Coll, Colonsay, Rum, Eigg, Tiree, Lismore, and Ulva. The number of inhabited isles is over 100, and the population is nearly 100,000. The outer range consists almost exclusively of gneiss rocks, with poor soil and large proportions of peat and moor. The inner range is composed chiefly of trap and slate. The scenery of the islands may be generally described as partaking of the wild and sublime. Large masses of mountains of all forms tower up in the interior; and the coasts, indented by arms of the sea, are rugged and varied in outline. Spots of great beauty—green pastoral glens, sheltered bays and lakes—are interspersed with the wildest scenes. The climate, though mild, is humid and unsuitable for corn crops. Only a very small portion of the surface is arable; the greater part being mountains, and the valleys intersecting them narrow and frequently covered with peat moss. Much of the land has, however, been converted into sheep walks, and the moors and desolate tracks are often let at high rents to sportsmen. The development of the prosperity of the islands has been greatly aided by the construction of excellent roads, and by the establishment of various lines of steamers in connection with Glasgow, thus rendering the fine and in some respects unique scenery fully and easily accessible to tourists. One of the principal sources of wealth is that of the fisheries, Stornoway in the island of Lewis being the headquarters of that industry on the western coast.

The decline and ruin of the Hebridean peasantry were brought about by the rapacity of the landlords. A new system of management and high rents was imposed, in consequence of which numbers of the tacksmen, or large tenants, emigrated to America. The exodus continued for many years. Sheep-farming on a large scale was next introduced, and the crofters were thrust into villages or barren corners of the land. The consequence was that, despite the numbers who entered the army or emigrated to Canada, the standard of

civilization sank lower, and the population multiplied in the islands. The people came to subsist almost entirely on potatoes and herrings; and in 1846, when the potato blight commenced its ravages, a scene of nearly universal destitution ensued—embracing, over the islands generally, seventy per cent. of the population. Temporary relief was administered in the shape of employment on roads and other works; and an emigration fund being raised, from 4,000 to 5,000 of the people in the most crowded districts were removed to Australia.

The principal books on the Hebrides are Martin's *Description of the Western Islands of Scotland*, 1703; Pennant's *Tour in Scotland and Voyage to the Hebrides*, 1774; Sir Joseph Banks' *Contributions to Pennant's Tour*; Boswell's *Tour to the Hebrides with Samuel Johnson, LL.D.*; Macculloch's *Geological Account of the Hebrides*, 1816; Hugh Miller's *Cruise of the Betsy*; W. A. Smith's *Lewisiana, or Life in the Outer Hebrides*, 1874.

HEBRON, the most southern of the three cities of refuge west of Jordan, built "seven years before Zoan (Tanis) in Egypt." Tanis, according to Brugsch, was standing at least 2,400 years B.C. Hebron was originally called Mamre and Kirjath Arba, after Arba, one of the Anakim. It is frequently mentioned in the Old Testament. The present town incloses the *Haram* or sanctuary built over the supposed site of Machpelah; but if this site be (as seems probable) genuine, the ancient Hebron must have faced the cave, as is remarked by many ancient writers. The name Machpelah signifies "place of division," and the cave was therefore called as early as the sixth century *Spelunca Duplex*. In the twelfth century an iron door (still visible) is mentioned as leading from the Haram wall to the cavern. In 1167 A.D. Hebron became the see of a Latin bishop, and it was taken in 1187 by Saladin. In 1834 it joined the rebellion against Ibrahim Pasha, who took the town and pillaged it. Modern Hebron rises on the east slope of a shallow valley—a long narrow town of stone houses, the flat roofs having small stone domes. The main quarter is about 700 yards long, and two smaller groups of houses exist north and south of this. The hill behind is terraced, and luxuriant vineyards surround the place, which is well watered on the north by three principal springs, including the Well Sirah. Three conspicuous minarets rise, two from the Haram, the other in the north quarter. The population includes 17,000 Moslems and 600 Jews.

HECATÆUS, son of Hegesander, was sprung from an ancient and noble family of Miletus. His life seems to fall between the years 550 and 475 B.C. His earlier years were spent in traveling. He lived some time in Egypt; he was well acquainted with the resources and power of the Persian empire, and the extant fragments of his writings seem to imply personal acquaintance with Libya, Spain, and Italy, as well as with the countries bordering on the Ægean and Euxine seas. After middle life he seems to have settled in Miletus, where he occupied a position of great honor, and to have devoted his time to composition of geographical and historical works.

HECATÆUS, of Abdera, sometimes confounded with Hecateus of Miletus, was a Greek historian and philosopher of the fourth century B.C. He was a disciple of Pyrrho and a contemporary of Alexander the Great and Ptolemy Sotor.

HECATE, a Greek goddess who is never mentioned in Homer, but is of great importance in other parts of the literature as well as in religious observance. The name Hecatos, the masculine corresponding form, is a frequent epithet of Apollo; and though the word Hecate is never

used exactly as an epithet of *Artemis*, yet this suggests a close relationship between the two goddesses, which an examination of their functions fully confirms. Their character and attributes stamp both as moon-goddesses. In fact, though often distinguished from *Artemis*, yet at other times *Hecate* is identified with her. The worship of *Hecate* seems to have flourished especially among the wilder tribes of Greek nationality, in *Samothrace*, *Thessaly*, and elsewhere; she has, however, been received into the Pantheon of the more civilized Greek races, probably on account of her close resemblance to *Artemis*; and this is doubtless the meaning of *Hesiod's* statement that she alone of all the Titanic powers was left undisturbed in her honors by *Zeus*. The parentage of *Hecate* is variously given. *Hesiod* names her father *Perseus* (a word connected with *Perseus*, *Persephone*, etc., all of which denote powers of light) and her mother *Asteria*, the starry sky of night. *Zeus* and *Demeter*, *Zeus* and *Hera*, etc., are also named as her parents.

HECKMOND WYKE, a town of England, in the West Riding of Yorkshire, on the Huddersfield and Bradford Railway, two miles northwest of Dewsbury and ten miles southwest of Leeds. Population about 10,000.

HECLA. See **ICELAND**.

HECTOR, son of *Priam* and *Hecuba*, the champion of the Trojans and the mainstay of their city. Like *Paris* and other Trojans, he had an Oriental name, *Darius*, as well as a Greek one, an interesting fact on which many fanciful theories have been founded. He was married to *Andromache*, daughter of *Eetion*, king in the Cilician *Thebe*. By *Homer* his character is drawn in most favorable colors as a good son, a loving husband and father, and a trusty friend, — religious without superstition, tender-hearted yet courageous. He is an especial favorite of *Apollo*, and later poets even describe him as son of that god. When *Achilles*, enraged with *Agamemnon*, deserted the Greeks, *Hector* drove them back to their ships, which he almost succeeded in burning. *Patroclus*, the friend of *Achilles*, who came to the help of the Greeks, was slain by *Hector* with the help of *Apollo*. Then *Achilles*, to revenge his friend's death, returned to the war, slew *Hector*, dragged his body behind his chariot to the camp, and afterward dragged it around the tomb of *Patroclus*. *Priam*, guarded by *Hermes*, went to *Achilles* and prevailed on him to give back the dead body, which was buried with great honor.

HECUBA (the Latin form of the Greek *Hekabe*), wife of *Priam*, is in *Homer* daughter of the Phrygian king *Dymas*, who dwelt on the bank of the *Sangarius*; but according to *Euripides*, *Virgil*, etc., her father was named *Cisseus*. According to *Homer* she was mother of nineteen of *Priam's* fifty sons. When *Troy* was captured and *Priam* slain, she was made prisoner by the Greeks. Her fate is told in various ways, most of which connect her with the promontory *Cynossema*, on the Thracian shore of the *Hellespont*.

HEDA, **WILLEM CLAASZ**, Dutch painter, born at Haarlem it is said in 1594, and still living there in 1668, was one of the earliest Dutchmen who devoted himself exclusively to the painting of still life.

HEDGEHOG (*Erinaceus europæus*, Linn.), is the best known, and from an anatomical point of view perhaps the most characteristic, of the *Insectivora*. The genus is remarkable for its dentition, its armature of spines, and its short tail, while the ordinary species is characterized by not having the spines longer than the head or the ears more than half that length. The upper jaw is longer than the lower one, and the whole snout, which is long and flexible, has somewhat the appearance

of that of the hog; the nostrils are narrow; and the claws are long but weak. The animal is about ten inches long, its eyes are small, and the integument of the ventral surface is covered with hairs of the ordinary character.

The most remarkable point in its external appearance is the possession of spines, and the power possessed by it of rolling itself up into a ball, from which these spines stand out in every direction. The spines, which are modified hairs, are sharp, hard, and elastic, and form so efficient a defense that there are but few animals that are able, and even they rarely, to effect a successful attack on this curious creature. The moment it is touched, or even hears the sound of so slight a menace as the report of a gun, it rolls itself up by the action of the powerful muscles which lie just beneath the skin, while the same contraction effects the erection of the spines.

During the cold of winter it passes into a state of complete hibernation, and its temperature falls very considerably; having provided itself with a nest of dry leaves, it is well protected from the influences of the rain, and, rolling itself up, it remains undisturbed till distinctly warmer weather returns. In July or August the female brings forth four to eight young, or, according to others (*Bell*), two to four at a somewhat earlier period; at birth the spines, which in the adult are black in the middle, are white and soft, but soon harden, though they do not attain their full size until the succeeding spring. It is commonly found in woods and gardens, and extends over nearly the whole of Europe; it has been found at 6,000 to 8,000 feet above the level of the sea. It can be tamed and is useful, as it has a voracious appetite for beetles. The English gypsies eat it, and claim that its flesh is superior to that of the rabbit.

HEDGE-SPARROW. See **SPARROW**.

HEEM, **JAN DAIDSZ VAN** (or **JOHANNES DE**), was born according to *Houbraken* and *Sandart* in 1604; according to *Descamps* in 1600, at Utrecht, and died at Antwerp in 1683 or 1684. *Thoré* has said of *Heda*, but it is only true of *De Heem*, that "he glorified insects, butterflies, and all the minute beings that swarm in vegetation, and made the moth drink in cups of chased gold." He was, if not the first, certainly the greatest painter of still life in Holland; no artist of his class combined more successfully perfect reality of form and color with brilliancy and harmony of tints.

CORNELIUS DE HEEM, the son of *Johannes*, was in practice as a flower painter at Utrecht in 1658, and was still active in his profession in 1671 at the Hague. His pictures are not equal to those of his sire, but they are all well authenticated, and most of them in the galleries of the Hague, Dresden, Cassel, Vienna, and Berlin.

DAVID DE HEEM, another member of the family, entered the guild of Utrecht in 1668, and that of Antwerp in 1693. The best piece assigned to him is a table with a lobster, fruit, and glasses, in the gallery of Amsterdam; others bear his signature in the museums of Florence, St. Petersburg and Brunswick.

HEEMSKERK, **JOHAN VAN**, Dutch poet, was born at Amsterdam in 1597, and died there in 1656.

HEEMSKERK, **MARTIN JACOBSZ**, sometimes called *Van Veen*, was born in Holland in 1498, and apprenticed to *Cornelisz Willemsz*, a painter at Haarlem. He was selected to coöperate with *Antonio da San Gallo*, *Battista Franco*, and *Francesco Salviati* to decorate the triumphal arches erected at Rome in April, 1536, in honor of *Charles V.* *Vasari*, who saw the battle-pieces which *Heemskerk* then produced, says they were well composed and boldly executed. On his return to the Netherlands he settled at Haarlem, where

he soon (1540) became president of his guild, married twice, and secured a large and lucrative practice. In 1572 he left Haarlem for Amsterdam, and died in 1574.

HEEREN, ARNOLD HERMANN LUDWIG, an eminent German historian, was born October 25, 1760, at Arbergen near Bremen. He studied philosophy, theology, and history at Göttingen, and thereafter traveled in Italy, France, and the Netherlands. In 1787 he was appointed one of the professors of philosophy at Göttingen, and he afterward was chosen aulic counselor, privy counselor, etc.; received in short those rewards which are the lot of successful German scholars. He died March 7, 1842.

HEGEL, GEORG WILHELM FRIEDRICH, was born at Stuttgart on August 27, 1770. In the autumn of 1788 he entered at Tübingen as a student of theology; but his sermons were a failure; and, instead of seeking after academical distinction, he found more congenial reading in the classics, on the advantages of studying which his first essay was written. After two years he took the customary degree of Ph.D., and in the autumn of 1793 received his theological certificate.

His university career, unlike that of Schelling, who, five years younger, came to Tübingen in 1790, was not brilliant. Hegel was quietly making himself at home in the Greek and Roman world, and gathering stores of miscellaneous information. But he gained most from intellectual intercourse with his contemporaries. Several of these are mentioned, but the two best known to fame were Hölderlin and Schelling. The former, who was of the same age as Hegel, left for Jena about the time that Schelling arrived. With him Hegel learned to feel for the old Greeks a love which grew stronger as the semi-Kantianized theology of his teachers more failed to interest him. With Schelling like sympathies bound him. They both protested against the political and ecclesiastical inertia of their native state, and adopted with fervor the revolutionary doctrines of freedom and reason.

Like many a German student, Hegel was glad of a tutorship, in 1793, when his university course ended. For three years he taught the children of a M. Steiger of Tschugg. Tschugg was the summer residence of the family, near Erlach on the lake of Biel; in winter they lived in Bern. Little happened in these years. Hegel had a few acquaintances in Bern; but, on the whole, intellectually he lived in isolation. But the main factor in Hegel's mental growth came from his study of Christianity. Under the impulse given by Lessing and Kant he turned to the original records of Christianity, and attempted to construe for himself the real significance of Christ. He wrote a life of Jesus, in which Jesus was simply the son of Joseph and Mary. He did not stop to criticise as a philologist, and simply ignored the miraculous. He asked for the secret contained in the conduct and sayings of this man which made him the hope of the human race. To Hegel, Jesus appeared as revealing the unity with God in which the Greeks in their best days unwittingly rejoiced, and as lifting the eyes of the Jews from a lawgiver who metes out punishment on the transgressor, to the destiny which in the Greek conception falls on the just no less than on the unjust.

During these years of arduous wrestling with the problems of religion, Hegel kept up a slack correspondence with Schelling and Hölderlin. Schelling was already on the way to fame. He was trying (to quote his own words) to find the premises to the results of Kant. Meanwhile he kept Hegel abreast with German speculation. After lamenting his want of books, Hegel concludes a letter of 1795 with the words, "Let reason and

freedom remain our watchword, and our point of union the church invisible."

Toward the close of his engagement at Bern, Hegel had received hopes from Schelling of a post at Jena. Tired of isolation, he was anxious to get away from Bern. Fortunately his friend Hölderlin, who was now tutor in Frankfort, secured a similar situation there for Hegel in the family of a Herr Gogol, a merchant. Hegel entered upon his new post in January, 1797.

It may have been the political position of Frankfort that made Hegel about this time turn to questions of economics and government. He had studied Gibbon, Hume, and Montesquieu in Switzerland.

The best evidence of Hegel's attention to contemporary politics is two unpublished essays—one of them written in 1798, "On the Internal Condition of Würtemberg in Recent Times, particularly on the Defects in the Magistracy," the other a criticism on the constitution of Germany, written, it is probable, not long after the peace of Lunéville (1801). The main feature in the pamphlet is the recognition that a spirit of reform is abroad. If Würtemberg suffered from a bureaucracy tempered by despotism, the Fatherland in general suffered no less. "Germany," so begins the second of these unpublished papers, "is no longer a state." Referring the collapse of the empire to the retention of feudal forms and to the action of religious animosities, Hegel looked forward to reorganization by a central power (Austria) wielding the imperial army, and by a representative body elected by the geographical districts of the empire. But such an issue, he saw well, could only be the outcome of violence—"blood and iron."

At Frankfort, the philosophic ideas of Hegel first assumed the proper philosophic form. In a MS. of one hundred and two quarto sheets, of which the first three and the seventh are wanting, there is preserved the original sketch of the Hegelian system, so far at least as the logic and metaphysics and part of the philosophy of nature are concerned. The third part of the system—the ethical theory—seems to have been composed afterward; it is contained in its first draught in another MS., of thirty sheets.

Hegel arrived at Jena in January, 1801. An end had already come to the brilliant epoch at Jena, when the romantic poets, Tieck, Novalis, and the Schlegels made it the headquarters of their fantastic mysticism, and Fichte turned the results of Kant into the banner of revolutionary ideas. Schelling was the main philosophical lion of the time; and in some quarters Hegel was spoken of as a new champion summoned from Swabia by Schelling to help him in his struggle with the more prosaic continuators of Kant. Hegel's first performance seemed to justify the rumor. It was an essay on the difference between the philosophic system of Fichte and Schelling, tending in the main to support the latter. Still more striking was the agreement shown in the *Critical Journal of Philosophy*, which Schelling and Hegel wrote conjointly during the year 1802-3.

Hegel's earliest lectures, in the winter of 1801-2, on logic and metaphysics were attended by about eleven students. At a later period, in 1804, we find him with a class of about thirty, lecturing on his whole system; but his average attendance was rather less. Besides philosophy, he once at least lectured on mathematics.

On October 14, 1806, Napoleon was at Jena. But Hegel, like Goethe, felt no patriotic shudder at the victory, and in Prussia he saw only a corrupt and conceited bureaucracy. The scholar's wish was to see the clouds of war pass away, and leave thinkers to their peaceful work. Early in 1807 he went to Bamberg, and stayed for about eighteen months. Of his editorial work there is little to tell.

From December, 1808, to August, 1816, Hegel was schoolmaster. Bavaria, at this time under the direction of Montgelas, was modernizing her institutions. The school system was reorganized by new regulations, which, *inter alia*, prescribed a training in philosophy as part of the gymnasial course. To this regulation (with which Hegel, however, was not agreed) we owe a series of lessons in the outlines of philosophy—ethical, logical, and psychological—which Hegel drew up with great care and many revisions. They were published in 1840 by Rosenkranz from Hegel's papers.

As a teacher and master Hegel seems to have been fairly successful. He inspired confidence in his pupils and maintained discipline without pedantic interference in their associations and sports.

On September 16, 1811, in the summer vacation, Hegel married Marie von Tucher. Two sons were born to them; the eldest, Karl, born June 7, 1813, has since become eminent as a historian. The younger was named Immanuel, born September 24, 1816. The year after his marriage appeared the first two volumes of his *Wissenschaft der Logik*, and the work was completed by a third in 1816. This work, in which his system was for the first time presented in what, if we except a few minor alterations, was its ultimate shape, found some audience in the world, and from here and there came voices of encouragement. Toward the close of his eighth session three professorships were almost simultaneously put within his reach,—at Erlangen, Berlin, and Heidelberg.

In 1817 he brought out the *Encyclopædia of the Philosophical Sciences*, in outline, for use at his lectures. In its first form it was a small treatise of about 300 octavo pages; but in the second of 1827, and the third of 1830, it rapidly grew to twice the original bulk. It is the only exposition of the Hegelian system as a whole which we have direct from Hegel's own hand. Besides this he wrote two reviews for the Heidelberg *Jahrbücher*—the first on Jacobi, the other a political pamphlet which called forth violent criticism. It was entitled a *Criticism on the Transactions of the Estates of Württemberg in 1815-16*. After two years at Heidelberg Hegel accepted the renewed offer of the chair of philosophy at Berlin, which had been kept vacant since the death of Fichte.

During his thirteen years at Berlin Hegel's whole soul seems to have been in his lectures. Between 1823 and 1827 his activity reached its maximum. His notes were subjected to perpetual revisions and additions. We can form an idea of them from the shape in which they appear in his published writings. During these years hundreds of hearers from all parts of Germany, and from beyond the Fatherland, came under his influence. His fame was carried abroad by eager or intelligent disciples. At Berlin Henning served to prepare the intending disciples for fuller initiation by the master himself. Gans and Hotho carried the method into special spheres of inquiry. At Halle Hinrichs maintained the standard of Hegelianism amid the opposition or indifference of his colleagues. Three courses of lectures are especially the product of his Berlin period: those on aesthetics, the philosophy of religion, and the philosophy of history. One of the last literary undertakings in which Hegel took part was to give his support to Gans and Varnhagen von Ense in the establishment of the Berlin *Jahrbücher für Wissenschaftliche Kritik*. The aim of this review was to give a critical account, certified by the names of the contributors, of the more important literary and philosophical productions of the time, in relation to the general progress of knowledge.

The revolution of 1830 was a great blow to him, as to many other Germans; and the prospect of democratic

advances almost made him ill. His last literary work was an essay on the English Reform Bill of 1831, the first part of which appeared in the *Preussische Staatszeitung*. He died November 14, 1831.

HEIBERG, JOHAN LUDVIG, Danish poet and critic, was the son of the political writer Peter Andreas Heiberg, and of the famous novelist, afterward the Baroness Gyllembourg-Ehrensvärd. He was born at Copenhagen, December 14, 1791. In 1812 he visited Sweden, and made a long stay in Stockholm; he afterward sent to his mother from Upsala the first important poem which he composed, *The Return Home*, a piece of remarkable strength and brightness. In 1813 his first publication appeared, a romantic drama for children, entitled *The Theater for Marionettes*. This was followed by *Christmas Jokes and New Year's Tricks* in 1816, *The Imitation of Psyche*, 1817, and *The Prophecy of Tycho Brane*. In 1817 Heiberg took his degree, and in 1819 went abroad with a grant from government. He proceeded to Paris, and spent the next three years there, under his father's roof. In 1822 he published his drama of *Nina*, and was made professor of the Danish language at the university of Kiel. At this town he delivered a course of lectures, comparing the Scandinavian mythology as found in the *Edda* with the poems of Oehlenschläger. In 1825 Heiberg came back to Copenhagen for the purpose of introducing the vaudeville on the Danish stage. In 1828 he brought out the national drama of *Elvernoi*. In 1835 the comedy of *The Elves*, and in 1838 *raa Morgana*. In 1841 Heiberg published a volume of *New Poems*, containing "A Soul after Death," which is perhaps his masterpiece, "The Newly Wedded Pair," and other pieces. All this time he had been busily engaged in editing the famous journal *The Copenhagen Flying Post*, which he founded in 1827 and continued until 1837. In 1831 he married Johanne Louise Pærges, the greatest actress that Scandinavia has produced. Heiberg's scathing satires at last began to make him very unpopular; and this antagonism reached its height when, in 1845, he published his little malicious drama of *The Nut Crackers*. Notwithstanding this he received in 1847 the responsible post of director of the national theater, for which indeed he was more eminently fitted than any other living person. He filled it for seven years. Heiberg died at Bonderup, near Ringsted, on August 25, 1860.

HEIDE, a town of Prussia, chief town of the circle of North Dithmarsen, province of Schleswig-Holstein, is situated on a small plateau which stands between the marshes and moors bordering the North Sea, thirty-five miles north-northwest of Glückstadt. Population, 7,000.

HEIDEGGER, JOHN HENRY, theologian, was born at Bärentschweu, in the canton of Zurich, Switzerland, in 1633, and died in 1698.

HEIDELBERG, a German university city in the Baden circle and jurisdiction of the same name, lies at the foot of the Castlehill, a spur of the Königsstuhl on the south bank of the Neckar, about twelve miles from the junction of that river with the Rhine. The situation of the town is one of romantic beauty. The town primarily consists of one long narrow street, the Hauptstrasse. To the south of this the Anlage, a pleasant promenade flanked with fine houses and gardens, leads directly from the chief station to the center of the town. A number of smaller streets run up from the river, intersecting the Hauptstrasse at right angles. On the other side of the Neckar the Heiligenberg, a vine-clad hill wooded toward the summit, crowned with the ruins of an old chapel, rises abruptly from the river bank.

Of the churches the chief are the Peterskirche (founded before 1392), where Jerome of Prague in 1460 expounded the Reformed doctrines; the Heiligegeistkirche,

erected at the beginning of the fifteenth century, of which the nave is used for Protestant, the choir for Old Catholic worship; and the Jesuitenkirche, with sumptuously decorated interior. The rathhaus, the museum, and the university (1712) are large but common-place erections. The chief building at Heidelberg, and, indeed, its chief attraction for strangers, is the famous castle which overhangs the west part of the town. It is situated on the Castlehill, more properly called the Jettenbuhel, 330 feet above the Neckar. Though now a ruin, yet its extent, its magnificence, its beautiful situation, its interesting history, render it by far the most noteworthy, as it certainly is the grandest and largest, of the old castles of Germany. The castle contains an interesting antiquarian museum formed by the Count Graimberg, and the celebrated Great Tun, which was built in 1751, but has been only used on one or two occasions. Its capacity is 49,000 gallons.

The university of Heidelberg is the oldest in the German kingdom. It was founded in 1350 by the elector Rupert, but it was not till 1386, when it obtained papal sanction, that its real life begins. It was constructed after the type of Paris, had four faculties, and possessed numerous privileges. Marselius von Inghen was its first rector. Frederick the Victorious, Philip the Upright, and Louis V. respectively cherished it. Otto Henry gave it a new organization, further endowed it, and founded the library. At the Reformation it became a stronghold of Protestant learning. The famous Heidelberg catechism was drawn up by its theologians. Damaged by the Thirty Years' War, it led a struggling existence for a century and a half. A large portion of its remaining endowments were cut off by the peace of Lunéville (1801). In 1803, however, the elector Charles Frederick raised it anew, and reconstituted it under the name of "Ruperto-Carolina." At present (1902) it has over 150 ordinary and extraordinary professors. The students number in all departments about 1,464. In 1703 the new library was founded: it has now nearly 700,000 volumes, besides 4,700 valuable MSS. Its faculties embrace theology, jurisprudence, medicine, and philosophy. Population of Heidelberg (1901), 40,119.

HEILBRONN, a town of Württemberg, in the circle of the Neckar, is situated in a pleasant and fruitful valley on the Neckar, and at the junction of several railways, twenty-six miles north of Stuttgart. The population (1901) was 37,891.

HEILIGENSTADT, a town of Prussian Saxony, government district of Erfurt, is situated on the Leine and on the railway from Halle to Cassel, thirty-two miles east-northeast of Cassel. Population, 6,000.

HEILSBURG, a town of Prussia, capital of a circle in the government district of Königsberg, is situated at the junction of the Simser and Alle, thirty-eight miles south of Königsberg. Population, 6,000.

HEILSBRONN, or KLOSTER-HEILSBRONN, a market-village in the Bavarian government of Middle Franconia, with a station on the railway between Nuremberg and Ansbach.

HEIM, FRANÇOIS JOSEPH, French painter, belongs to that group of painters in whose works we find the special characteristics of the Restoration. Born at Belfort on December 16, 1787, he early distinguished himself at the École Centrale of Strasburg, and in 1803 entered the studio of Vincent at Paris. In 1807 he obtained the first prize, and in 1812 his picture of *The Return of Jacob* (Musée de Bordeaux) won for him a gold medal of the first class, which he again obtained in 1817, when he exhibited, together with other works, a *St. John*—bought by Vivant Denon. In 1810 the *Resurrection of Lazarus* (Cathédral Autun), the *Martyrdom of St. Cyr* (St. Gervais), and two scenes from the life of

Vespasian (ordered by the king) attracted attention. In 1823 the *Reërection of the Royal Tombs at St. Denis*, the *Martyrdom of St. Laurence* (Notre Dame), and several full-length portraits increased the painter's popularity; and in 1824, when he exhibited his great canvas, the *Massacre of the Jews* (Louvre), Heim was rewarded by the legion of honor. In 1827 appeared the *King Giving Away Prizes at the Salon of 1824* (Louvre—engraved by Jazet)—the picture by which Heim is best known—and *Saint Hyacinthe*. Heim was now commissioned to decorate the Gallery Charles X. (Louvre), work for which he was thought eminently fit. Heim replaced Regnault at the Institute in 1834, shortly after which he commenced a series of drawings of the celebrities of his day, which are of much interest. His decorations of the Conference room of the Chamber of Deputies were completed in 1844; and in 1847 his works at the Salon—*Champ de Mai* and *Reading a Play at the Théâtre Français*—were the signal for attacks maintained with great violence. In 1851 Heim was awarded the great gold medal, and in 1855—having sent to the Salon no less than sixteen portraits, among which may be cited those of *Cuvier*, *Geoffrey de St. Hilaire*, and *Madame Hersent*—he was made an officer of the legion of honor. In 1859 he again exhibited a curious collection of portraits, sixty-four members of the Institute arranged in groups of four; and six years later, on September 29, 1865, he died, at the age of seventy-eight.

HEINE, HEINRICH, poet and journalist, was born on December 13, 1799, at Düsseldorf, of Jewish parents. Heine received the rudiments of his education at the gymnasium or *lycée* (as it was called during the foreign occupation) of his native town, and acquired while there a good knowledge of French and English, as well as some tincture of the classics and Hebrew. But if the influence upon him of his teachers and their teaching was unimportant, not so was that of the public events amidst which he grew up. His early years coincided with the most brilliant period of Napoleon's career; and the boundless veneration which he is never tired of expressing for the emperor throughout his writings shows that his true schoolmasters were rather the drummers and troopers of a victorious army than the Jesuit fathers of the *lycée*. Heine entered the university of Bonn in the spring of 1819. During his stay there he was an eager student, but the subjects to which he devoted himself had no connection with the profession of law which had been chosen for him. He seems to have attended no lectures save those on literature and history—notably A. W. von Schlegel's; and he not long afterward acknowledged his obligations to Schlegel by dedicating a sonnet to him—a tribute which he recalled in later days by a wanton and outrageous attack upon the veteran critic in *Die Romantische Schule*. Why Heine left Bonn does not clearly appear, but it is at Göttingen that we find him in the autumn of 1820. His stay here was even shorter than at Bonn. In February, 1821, the authorities of the "Georgia Augusta" rusticated him for some infraction of the dueling laws. Although from these beginnings Heine's academical career promised to pursue no very even course, he nevertheless determined, after his residence at Göttingen had been cut short, to seek a third university; and it was to Berlin that he now repaired, where Hegel was at the zenith of his renown. He began to contribute poems to the *Berliner Gesellschaften*, many of which were subsequently incorporated in the *Buch der Lieder*, and in 1822 a volume came from the press entitled *Gedichte von Heinrich Heine*, his first avowed act of authorship. He was still further employed at this time as the correspondent of a Rhenish newspaper, as well as in completing his tragedies *Almansor* and *William Ratcliff*, which were pub-

lished in 1823 with small success. He was now, indeed, fairly embarked upon his literary course. But he was still largely dependent upon his uncle; and in order so far to fulfill his engagements toward his benefactor, he returned to Göttingen in 1825, and shortly afterward took his degree in law, having previously qualified himself for practice by publicly professing Christianity.

Heine seems never to have made any serious attempt to practice law. His life from the year 1826 until his death was devoted entirely to literature, and more especially to journalism, which alone indeed was the main source of his income for many years. At first he lived in Hamburg, and then it was that, besides the *Buch der Lieder*, the earlier portions of the *Reisebilder* appeared, both of which, but particularly the latter, at once created an immense sensation throughout Germany, not only among the youthful and enthusiastic, who found their own sentiments expressed by the new writer with the happiest audacity, but among such dignified and *rangés* personages as Metternich and Gentz. In 1827 Baron Cotta, the Bavarian publisher, offered Heine, who had risen at a bound into celebrity, the joint-editorship of the *Allgemeine Politische Annalen*. The young author accepted the offer, and betook himself to Munich in the winter of that year, after having paid a visit to London. He remained for a considerable period in the South German capital, and it was owing, not to any disagreement with his employer, but to the demands of the court of Prussia, which was not long in taking umbrage at his freedom of opinion, that his editorial function ceased so abruptly as it did. What the secret history of the next two or three years of his life was — whether from the very first he really was an object of especial disfavor at Berlin, or whether, as is quite as likely, taking his vanity and love of publicity into account, he exaggerated his powers of offense beyond the endurance of the government there, and forced it into what seemed a petty persecution — he presently perceived that he must either quit Germany altogether or prepare for a lifetime, perhaps, of fortress-imprisonment. He did not long hesitate between these two alternatives, and on May 1, 1831, Heinrich Heine left his native land for Paris, where he lived for the rest of his life, only once recrossing the Rhine, in 1843.

After settling in his new home, where his life for many years must have been as gay and brilliant as latterly it was sad and somber, and where he speedily became more or less intimate with such writers as Balzac, Dumas the elder, George Sand, Victor Hugo and Théophile Gautier, Heine devoted himself more exclusively than ever to journalism; and from 1831 until 1847, he was an active and indefatigable publicist. In 1839 *Shakespeare's Mädchen und Frauen* appeared — Heine acting in this slight work as cicerone through a gallery of Shakespeare's heroines. The year 1840 was signalized by the publication of *Heinrich Heine über Ludwig Börne*, a brochure of the wittiest and most trenchant satire, in which the German refugees in Paris — a fraternity whom Heine always anxiously avoided — were far more severely handled than was the defunct agitator whose name it bore, and who, it may be noted, was himself a Jew. In 1844 *Deutschland, ein Wintermärchen*, came forth — the result of the visit to Germany which has been alluded to as the sole journey of the kind which Heine undertook; and this effusion may be ranked, along with a similar performance, *Atta Troll* (1846), as belonging to his most inferior writings. It was in 1848 that Heine, in the very heyday of his activity, and with gigantic projects seething within him for the foundation of a journal, was suddenly prostrated by the disease which carried him off seven years later. His sufferings throughout that time are reported to have

been frequently excruciating, and he at length grew so habituated to the use of opium that the very largest doses failed to afford him relief. But when his malady — a softening of the spinal cord — allowed him a respite, his intellect was as clear and vivacious as ever; and it is to these closing years of his life, harassing as they were, that we are indebted for the finest and most finished of all his poems. He died February 17, 1856.

HEINECCIUS, JOHANN GOTTLIEB, a celebrated jurist, was born in 1681 at Eisenberg. He studied theology at Leipsic and law at Halle; and at the latter place he was appointed in 1713 professor of philosophy, in 1718 extraordinary, and in 1720 ordinary professor of jurisprudence. He subsequently filled legal chairs at Franeker in Holland, and at Frankfort, but finally returned to Halle in 1733 as professor of philosophy and jurisprudence. He died there, August 31, 1741.

HEINECKEN, CHRISTIAN HEINRICH (1721–1725), a child remarkable for extraordinary precocity of intellect. Able to speak at the age of ten months, by the time he was one year old he knew by heart the principal incidents in the Pentateuch. At two years of age he had mastered all sacred history; at three he was intimately acquainted with history and geography, ancient and modern, sacred and profane, besides being able to speak French and Latin; and in his fourth year he devoted himself to the study of religion and church history.

HEINSE, JOHANN JACOB WILHELM (c. 1746–1803), German romance writer, was born at Langenwiesen in the Thuringian Forest in 1746, and died in 1803.

HEINSIUS, or HEINS, DANIEL, one of the most famous scholars of the Dutch Renaissance, was born at Ghent in 1580. The troubles of the Spanish war drove his parents to settle first at Veere in Zealand, then in England, next at Ryswick, and lastly at Flushing. In 1594, being already remarkable for his attainments, he was sent to the university of Franeker to perfect himself in Greek under Henricus Schotanus. At Leyden he studied under Joseph Scaliger, and there he found Marxix de St. Aldegonde, Janus Douza, Paulus Merula, and others, and was soon taken into the society of these celebrated men as their equal. His proficiency in the classic languages won the praise of all the best scholars of Europe, and offers were made to him, but in vain, to accept honorable positions outside Holland. He soon rose in dignity at the university of Leyden. In 1602 he was made professor of Latin, in 1605 professor of Greek, and at the death of Merula in 1607 he succeeded that illustrious scholar as librarian to the university. The remainder of his life is recorded in a list of his productions. He died at the Hague in 1655.

HEINSIUS, NIKOLAES (1620–1681), Dutch scholar, was the son of Daniel Heinsius, and scarcely less illustrious than his father.

HEINSIUS, NIKOLAES, an illegitimate son of the subject of the last article, was born in 1655 at the Hague. At the age of twenty he wrote *The Delightful Adventures and Wonderful Life of Mirander*, the sole original romance produced in Holland during the seventeenth century.

HEIR. See INHERITANCE.

HELDER, or THE HELDER, a township of the Netherlands at the northern extremity of the province of North Holland, directly opposite the island of Texel. Since 1819 it has been the terminus of the North Holland canal, and is now connected (since 1865) by railway with Alkmaar and Haarlem. Its fortifications and its dykes are both constructed on an extensive scale, the former comprising four batteries and five forts, and the latter being the most striking on the whole coast. A garrison of 7,000 to 9,000 men

is necessary for the defense of the place, and 30,000 men could be accommodated within the lines. The harbor, called the Nieuwe Diep, is one of the best in Europe. Its area is 6,560 feet long by 330 to 490 broad, and it has depth enough for the largest vessels, which are admitted to the North Holland Canal by the Koopvaarders sluice. The government arsenal comprises an extensive wet dock, a dry dock, and auxiliary establishments. Population, (1901), 25,842.

HELENA, daughter of Zeus and of Leda the wife of Tyndareus king of Sparta, was sister of Castor, Pollux, and Clytemnestra, and was married to Menelaus. According to Homer she was obliged by Aphrodite to flee with Paris to Troy; and after the Trojan War she returned with Menelaus and lived with him as queen in Sparta. She had only one child, a daughter named Hermione, who was married to Neoptolemus. In the Homeric poems her character is drawn with marvelous skill; forced by the gods to do what she regrets, she seems to be separated from the wrong that she does, and remains always an object of interest and respect. Goethe (*Faust*, part ii.) introduces Helena apparently to symbolize the Greek spirit acting on the modern mind. Among later poets the tales of Helen are much more complicated. She was carried off by Theseus to Attica in her childhood, but was recovered by her brothers. Her character often suffers much in the tales followed by lyric and tragic poets. Stesichorus and Euripides (*Helena*), however, relate that Paris on his homeward voyage was driven by stress of wind to Egypt. Proteus, king of Egypt, learning the facts, detained the real Helen in Egypt, while a shadowy Helen was taken to Troy and fought for. Menelaus on his way home from Troy was also driven to Egypt, and there found his true wife.

HELENA, SAINT, a woman of humble origin, said to have been the daughter of an innkeeper, was the wife of Constantius Chlorus. Of her nationality nothing certain is known. She had one son, Constantine the Great. In 292 A.D. Chlorus was raised to the purple by the emperors Diocletian and Maximian, and forced to divorce Helena to make room for a more noble wife. After her son became emperor she was treated with great respect and styled Augusta, and cities in Bithynia and Lysia were after her named Helenopolis. She became a Christian when her son was converted, and during a pilgrimage to Jerusalem she claimed to have discovered the holy sepulcher and the true cross.

HELENA, the capital of Montana, also of the county of Lewis and Clarke, is situated in what is known as Prickly Pear valley, at the base of the Rocky mountains, and within easy distance of the Missouri river. The railway facilities include the Northern Pacific, Manitoba and Union Pacific systems, the latter company operating a branch road between Helena and Butte city where connection is made with the main line. In addition to these, there are a number of local roads, together with street railways and electric roads in operation between the city centers and the suburbs surrounding. The city contains five banks, churches of all denominations, two daily and several weekly papers, five schools, two academies conducted under the auspices of the Catholic Church, also a Protestant Episcopal School, a court house, completed at a cost of \$250,000; three libraries, the United States Land and Assay offices, a smelter with a daily capacity of sixty-five tons of silver bullion, reduction works, also manufacturing of woollens, lumber, tile, trunks, flour, cornices, metal roofing, tinware, iron castings, etc. The government of the city is vested in a mayor and common council, and the departments of fire, police, water, sewerage, etc., are well ordered and maintained. In

the immediate vicinity of Helena are mines of gold and silver, marble, granite, coal, etc., all of exceptional richness, and within four miles of the city are a series of hot springs, the waters of which possess recuperative properties of great excellence. The city is growing rapidly in extent and population, and the improvements proposed and completed are of the most substantial and expensive character. The population according to the census of 1900 was 10,770.

HELENA, an Arkansas town, the county seat of Phillips county, is situated on the Mississippi river about eighty miles below Memphis, on the opposite bank. The most of the trade of the town is in cotton seed oil, agricultural implements, farm produce, etc. The town has railroad connections, banks and telegraphs. It is slowly growing in population and commerce, and its inhabitants numbered in 1900 (U. S. census) 5,550.

HELENSBURGH, a town and favorite watering-place of Dumbartonshire, Scotland, is situated at the mouth of the Gareloch, a branch of the Firth of Clyde, opposite Greenock, which is about four miles distant. It is twenty-four miles northwest of Glasgow. Population (1901), about 15,000.

HELIAND (*i.e.* *Heiland*) is an Old Saxon poem of the ninth century. According to some critics it is a fragment of a larger work which dealt with the entire historical material of the Old and New Testaments. The part which we now possess sets forth the life of Christ as told by the four evangelists, whose various narratives the author seeks to harmonize.

HELICON, a mountain, or more strictly a mountain range, of Boeotia in ancient Greece, celebrated in classical literature as the favorite haunt of the Muses, is situated between Lake Copais and the Gulf of Corinth. On the fertile eastern slope stood a temple and grove sacred to the Muses, and adorned with beautiful statues, which, taken by Constantine the Great to beautify his new city, were consumed there by a fire in 404 A.D. Hard by sparkled the famous fountains of poetic inspiration, Aganippe and Hippocrene, and latter fabled to have gushed from the earth at the tread of the winged horse Pegasus, whose favorite browsing place was there. At the neighboring Ascrea dwelt the ancient Hesiod, a fact which probably enhanced the fame of the region.

HELIGOLAND (German *Helgoland*), *Heiligeland*, or *Hellige Land*, is one of the Frisian Islands, and formerly an English possession, situated in the North Sea, thirty-six miles from Cuxhaven at the mouth of the Elbe, and about 100 from Hamburg. Though the red cliffs of the Rock Island are most familiar to the voyager entering the Elbe, there are in reality two islets, the second being the Dune or Sand Island, now lying a quarter of a mile east of the main one, though at one time connected with it by *de waal*, a neck of land which the sea broke through and destroyed in 1720. On this islet there are some 500 houses, divided into a lower town or *Unterland*, on the spit, and an upper town or *Oberland*, situated on the cliff above and connected with the lower town by a wooden stair of 190 steps, the only possible mode of communication between the two sections. There is also a lighthouse; but, though a few guns are placed behind a rude earthwork, there are no fortifications except the inaccessible cliffs of the island, and no garrison of any kind unless a few coast-guardsmen be considered as such. The greatest length of the island, which slopes somewhat from west to east, is 5,880 feet, and the greatest breadth 1,845 feet, its circumference 13,500 feet, its average height 108 feet, and the highest point 216 feet. The Dune or Sand Island is little more than a sand-bank covered with scanty herbage, and imperfectly

bound together by bent, grass, and carices. It is only about 200 feet above the sea at its highest point, but the drifting sands and the constant inroads of the sea make the height rather variable.

During the summer from 2,000 to 3,000 people visit the island for sea-bathing. Most of these are from Hamburg, English or other guests being rare. There are no English residents, the officials, the governor excepted, being either natives or Germans; and German, when Frisian is not employed, is the official language, though for form's sake on the postage stamps English and German words appear in duplicate. The natives speak a dialect of Frisian, barely intelligible to the other islands of the group. On June 18, 1890, the English premier, the marquis of Salisbury, announced in parliament that, by the terms of a treaty that day concluded, Heligoland had been transferred to Germany.

HELIODORUS, son of Theodosius, was born at Emesa in Syria, in the second half of the fourth century. He belonged to a family of priests of the Syrian sun-god Elagabalus, but he was himself a Christian, and became bishop of Trica in Thessaly. He is famous as the author of the best of the Greek love-romances. It is called *Æthiopica*, as it relates the history of Chariclea, daughter of Hydaspes, king of Æthiopia, her love for Theagenes, a Thessalian of high rank, and the happy issue after a series of exciting adventures and hairbreadth escapes.

HELIOGABALUS, a Grecized form of Elagabalus, the name of a Syrian deity, was the name adopted by Varius Avitus Bassinus, the Roman emperor.

Heliogabalus was in 218 recognized by the senate as emperor. After spending the winter in Nicomedia, he proceeded in 219 to Rome. He made it his business to exalt the honor of the deity whose priest he was. The Syrian god was proclaimed the chief deity in Rome, and all other gods his servants; splendid ceremonies in his honor were celebrated, at which Heliogabalus danced in public; and it was believed that secret rites, accompanied by human sacrifice, were performed in his honor. The shameless profligacy of the emperor's life was such as to shock even a Roman public. His popularity with the army declined, and Mæsa, perceiving that the liking of the soldiers inclined to Alexander Severus, persuaded him to raise his cousin to the dignity of Caesar (221). Heliogabalus soon repented of this step. An attempt to murder Alexander was frustrated by the watchful Mæsa. Another such attempt in 222 produced a mutiny among the soldiers, in which Heliogabalus and his mother, Sœmias, were slain.

HELIOGRAPHY is the name applied to the method of communicating between distant points in which visual signals are obtained by reflecting the rays of the sun from a mirror or combination of mirrors in the required direction. In favorable localities heliography possesses important advantages for military signaling over other methods, the principle being the portability of the apparatus, the great distance to which messages can be sent without retransmission, and the fact that the signals are visible to those only who are on the direct line of signaling.

The signals are produced by causing the reflected beam to appear and disappear or be obscured alternately at the distant point, the intervals of appearance and obscuration being usually varied in length, so as to produce the combinations of long and short signals known as the Morse alphabet. This is done in two distinct ways. In the first of these, known as signaling by "appearance," the reflected beam or "flash" is obscured from the receiving station except when a message is being transmitted, the flashes then giving the

signals or "dots" and "dashes;" while in the second method, or signaling by "obscuration," the flash is kept continually on the receiving station, and only obscured for intervals forming signals. The first method is more easily read by learners; the second is less fatiguing to the eyes, and possesses the advantage of enabling the signalist to correct the adjustment of his instrument at any time. Glass mirrors with a plane surface are employed, hence the angle of divergence of the extreme rays in the reflected beam is the same as that subtended by the sun's diameter at the point, or about thirty-two minutes of arc; this small divergence rendering the flash visible to great distances.

The distance through which signaling by this method can be carried on depends on the size of the mirror employed and the angle of reflection of the rays, a larger mirror giving a more intense "flash" than a small one, since it reflects more rays, and being therefore visible to a greater distance; also when the angle of reflection is nearly a right angle the flash will be more intense than when the rays are only diverted through a small angle from the greater extent of surface exposed to the sun's rays. The range, however, depends to so great a degree on the state of the atmosphere that it is impossible to assign any limits to the distance that the flash might be seen through in exceptionally clear weather. From the Himalayas a five-inch mirror has been found to give very distinct signals over a distance of sixty miles; but when the air was at all misty a very much larger mirror had to be employed. The more perfect reflection when the angle between the direct and reflected rays is large is not sufficient to compensate for the loss of intensity caused by the small number of reflected rays. Hence when this angle is greater than a right angle two mirrors are used, the sun's rays being reflected from one back to the other and thence to the distant point. This is called the duplex method of working.

HELIOPOLIS. See BAALBEC and EGYPT.

HELIOTROPE, or **TURNSOLE**, *Heliotropium*, L., a plant which follows the sun with its flowers and leaves, or, according to Theophrastus, which flowers at the summer solstice, a genus of usually more or less hairy herbs or undershrubs of the tribes *Heliotropiaceæ* of the natural order *Boraginæ*, having alternate, rarely sub-opposite leaves; small white, lilac, or blue flowers, in terminal or lateral one-sided simple or once or twice forked spikes, with a calyx of five deeply divided segments, a salver-shaped, hypogynous, five-lobed corolla, and entire four-celled ovary; fruit two to four sulcate or lobed, at length separable into four one-seeded nuts, or into two hard two-celled carpels; and seeds generally with a scanty albumen. In some species the cone surmounting the stigma is bearded. The heliotropes are indigenous mostly to tropical and subtropical regions, but a few species are natives of Europe.

HELIOTROPE, or **BLOODSTONE**, a cryptocrystalline variety of quartz, dark green in color, with small spots of red jasper, resembling drops of blood. It is used for signet rings and a variety of ornamental articles.

HELL. See ESCHATOLOGY.

HELLANICUS, the most important of the Greek logographers, was a native of Mytilene. His father was named Andromenes or Aristomenes. His life, which lasted eighty-five years, extends over the fifth century B.C., but the date of his birth is uncertain, and the circumstances of his career are unknown.

HELLEBORE, a genus of plants of the natural order *Ranunculaceæ*, natives of Europe, Western Asia, and North America. The leaves are palmate or pedate, are usually solitary, and have five persistent petaloid sepals, within the circle of which are placed the minute

gland-like tubular petals, the nectaries of Linnaeus, of the form of a horn with an irregular opening, and representing, according to Baillon, "the lower or outermost stamens transferred into staminodes." The stamens are very numerous, and are spirally arranged; and the carpels are variable in number, sessile or stipitate, and slightly united at the base, and dehiscence by ventral suture.

Of the numerous species of hellebore now grown, the deep-purple-flowered *H. colchicus* is one of the handsomest. *H. atropurpureus*, introduced in 1844, blooms in March or at the end of February, and may be effectively used in flower borders to succeed hepaticas, scillas and crocuses.

The rhizome of *H. niger* occurs in commerce in irregular and nodular pieces, from about one to three inches in length.

HELLENISTS was the name usually applied by those who called themselves Greeks (Hellenes) to all Grecizing and more especially to all Greek-speaking foreigners,—a class which, after the conquests of Alexander the Great, formed a large and important element in almost every community throughout the civilized world. More particularly the word is applied in the New Testament to Greek-speaking or "Grecian" Jews, who, besides being very numerous in the various countries of the dispersion, had also many synagogues in Jerusalem, and were remarkable there for their zeal.

HELLESPONT, the modern DARDANELLES, is variously named in classical literature Hellespontus, Pontus Helles, Hellespontum Pelagus, and Fretum Hellesponticum. It received its name from Helle, in Greek mythology, daughter of Athamas, king of Orchomenus in Boeotia, and of the goddess Nephele, whom he had married at the command of Hera (Juno). Athamas, however, secretly loved the mortal Ino, and, on his marrying her also, the dissensions between his wives became so great that he went to consult the Delphic oracle. The priestess there, bribed by Ino, assured him that the sacrifice of Phrixus, the brother of Helle, was necessary to domestic harmony; but Nephele, in order to save her children, dispatched them to Colchis, in Asia, on the back of the ram with the golden fleece. Helle, however, had the misfortune, when crossing this strait, to slip from her seat, and to be carried away by the current—hence the name *Hellespontus*, or "Sea of Helle."

HELL-GATE IMPROVEMENTS. For a great many years the obstructions to the entrance of New York harbor, at the junction of Harlem and East Rivers, had been a source of annoyance and danger to shipping, many vessels annually being damaged by collision with these hidden or partially hidden barriers, against which they were hurled by the current, made all the more violent by being pent up from the resistance afforded by the reefs. The number of vessels grounding was enormous, at times averaging thirty a month. The first attempt to remove these rocks was made in 1851, by surface blasting, a process which consisted of putting explosives on the surface of the reefs and firing them by a voltaic current. The detritus was not dredged away, it being thought that the current would wash them from the vicinity of their parent nucleus. The expense of the operation was borne by private subscription among the merchants and citizens of New York. The rocks thus attacked were Pot rock, where a depth of over eighteen feet was attained; Frying Pan rock, which was lowered to about sixteen feet; Way's reef, which gave a depth of fourteen feet; Baldheaded Billy, which was destroyed entirely; Sheldrake rock, which allowed a depth of sixteen feet, and Diamond rock, which was lowered two feet, then giving a depth of eighteen feet. The cost of these improvements was

about \$15,000, the destructive agents employed consisting almost entirely of blasting powder. This work, although alleviating the situation to some degree, was found inadequate for the demands of first-class vessels, and after considerable delay, the general government was induced to make a small appropriation to continue the work and render more effective the improvements thus begun. The civil war was at that time the thought paramount in the minds of the people, and it was not until this matter had been disposed of that anything of consequence was attempted. The first work under the auspices of the national government was begun in 1852, when the sum of \$20,000 was appropriated, and the depth of twenty-one feet was reached over Pot rock. As before stated, the political agitation of the country hindered the work, and the next important date in the history of the removal is 1866. At this time General Newton proposed a plan which, as afterward modified, was successful. His perfected plans necessitated the use of a floating platform or scow with an opening thirty-two feet in diameter in its center, through which an iron hemispherical bell was lowered to the rock below; in this bell the drills were placed and the bores for the blasting charges were made. Then the cartridges of nitro-glycerine were inserted, and the connections with the firing batteries made by divers, when the scow was floated away and the charges fired. By 1880 the work on the Diamond reef was completed, the broken pieces of rock being dredged and carried away. Coenties reef, Frying Pan, Pot rock, and Way's reef received similar treatment, as did also Flood rock, with (in the latter case) some slight variations, but in accordance with the plans and under the supervision of General Newton.

The removal of rock at Hallet's Point was accomplished in a different manner, the principal features of which were the sinking of a shaft on the shore, from which tunnels or galleries were driven out under the rock and charged with explosives and fired. The destruction of these various barriers was attained at a cost of nearly \$5,000,000, and the result was an average depth of twenty-six feet at mean low tide. The work was attended with extreme difficulty, and its successful accomplishment is a monument to the genius and perseverance of the men who undertook it. About nine acres of rock were removed, and the terrors of this formerly dangerous passage have been almost entirely obviated. The most modern methods were used in the different processes, and the experience of the engineers in this work has formed a valuable addition to the knowledge of submarine operators.

Delays at times were unavoidable, and the cost of the work was thereby increased, but in general terms the outlay may be said to have been justified and returned many times over by the benefits resultant on its accomplishment.

HELLIN, a town of Spain, in the province of Albacete, is situated on the slope of the Sierra de Segura, thirty-five miles south-southeast of Albacete. The population is about 8,000.

HELMERS, JAN FREDERIK, Dutch poet, was born at Amsterdam, March 7, 1767. His poems, published in 1809 and 1810, but especially his great work, *The Dutch Nation* (1812), created much enthusiasm and enjoyed immense success. Helmers died at Amsterdam, February 26, 1813.

HELMET, or HELM, is the term used in a general sense to include the various forms of head defenses, which were either made in solid metal or of metal plates. The form of helmet used among the Assyrians, as shown by the monumental sculptures, was a close-fitting skull-cap, round or conical, sometimes surmounted by a

crest rising from the summit of the cone and curving forward in a semicircular form. The Greek helmet was also in its simplest form a skull-cap, covering the head in front above the level of the eyes, but reaching down to the nape of the neck from ear to ear. The Etruscan helmet differed but slightly from that of the Greeks. It was more conical in form, and often furnished with horns or wings in place of a crest. The Roman helmet was usually a skull-cap, with or without crest, and often plain or undecorated. The Gaulish helmet, of which a beautiful specimen was obtained from an Iron Age burial at Berru, in Marne, in 1872, was of hammered iron, conical in shape, terminating in an ornamental apex, and having a richly decorated border round the lower part. Conical helmets of an earlier character found at Theil and Auxonne have been assigned to the Age of Bronze. The helmets worn by the Normans and Saxons at the time of the Conquest, as shown in the Bayeux tapestry, were conical in shape with a projecting nasal. In the end of the fifteenth century the great helm was superseded by the smaller headpiece with movable vizor and beaver or chin-piece and neck-guard, which is properly styled a helmet. Other varieties of headpiece were the bascinet, of a plain oval form pointed at the top and somewhat compressed on the sides, having holes at the bottom for the attachment of the camail or gorget of chain-mail. The bascinet was sometimes worn alone, and sometimes under the helm. It was succeeded in the fifteenth century, by the salade, a lighter skull-cap with the hinder part projecting, and occasionally a movable vizor. The armet, the burgonet and the casque are varieties of the lighter form of headpiece, partaking more or less of the skull-cap form, while the morion and the chapele de fer were distinguished by their flattened brims.

HELMOND, a town of the Netherlands, in the province of North Brabant, to the left of the River Aa, with a station on the state railway between Venloo and Eindhoven. Population, 7,000.

HELMONT, JEAN BAPTISTE VAN, was born at Brussels in 1577. He was educated at Louvain, and began the study of natural science under the Jesuits in that city. He graduated as M.D. in 1599, and made some useful discoveries in applied medicine. He died in Holland in 1644, in the sixty-seventh year of his age.

HELMSTÄDT, or **HELMSTEDT**, a town of Germany in the duchy of Brunswick, is situated on the railway from Magdeburg to Brunswick, twenty-three miles east of Brunswick. Population, 8,000.

HELOISE. See **ABELARD**.

HELOTS, in Grecian antiquity, were the serfs or bondsmen of the Spartans. The most probable of the various explanations of their origin seems to be that they were the early aborigines of Laconia, who, at the time of the Dorian invasion, were reduced to slavery by the conquerors. The Helots were the lowest class of the inhabitants of Sparta; but those of them who were emancipated formed the class of *Neodamodes*, next in political rights to Spartan citizens themselves. The *Mothones* or *Mathabes* were domestic slaves, who had been brought up along with the young Spartans, and afterward liberated. The Helots were the property of the state, which alone had a right of emancipating them, although it made over their services to individuals. They were attached to the soil—*adscripti glebe*—and could not be sold away from it. They were also employed on public works, and performed all domestic service. In time of war the Helots generally served as light-armed troops; but when, on special emergencies, they fought as *hoplites*, they were usually rewarded with

their freedom. The condition of the Helot was better than that of a slave in other Greek states; for, being a serf of the soil, he was not wholly at the mercy of his master, and there was a legal way whereby, after many stages, he could eventually obtain freedom and citizenship. After the Messenian war, however, when the multitude of the Helots made them formidable to the diminished number of the full citizens, there is no doubt that very cruel measures were adopted against them. The evidence is strong that the *Crypteia*, instituted ostensibly to inure the Spartan youth to hardship, was really intended to reduce the number of the Helots by assassination; and we know from Thucydides that on one occasion 2,000 Helots were treacherously massacred by the Spartan citizens.

HELPS, SIR ARTHUR, fourth and youngest son of Thomas and Ann Frisquett Helps, was born at Balham Hill, in the parish of Streatham and county of Surrey, on July 10, 1813. After the usual preliminary training at Eton, young Helps went to Trinity College, Cambridge, passing as B.A. in 1835, and taking his M.A. degree in 1839.

Soon after leaving the university, where he had established many valuable friendships, Arthur Helps became private secretary to Mr. Spring Rice (afterward Lord Monteagle), then chancellor of the exchequer in Lord Melbourne's administration. This appointment he filled till 1840, when he went to Ireland as the private secretary of Lord Morpeth (afterward earl of Carlisle), then the chief secretary of state for Ireland, where he remained until his principal left Ireland, in 1841, on the government passing from Lord Melbourne into the hands of Sir Robert Peel. When the clerkship of the Privy Council became vacant in 1860, on the resignation of the Hon. W. L. Bathurst, he was given the appointment.

During his early official career Helps cultivated literature with varying success. His *Essays Written in the Intervals of Business*, published in 1841, and his *Claims of Labor, an Essay on the Duties of the Employers to the Employed*, published in 1844, continue to interest, and are likely to keep their place in well-selected libraries. His two plays, *King Henry the Second, an Historical Drama*, and *Catherine Douglas, a Tragedy*, both published in 1843, have no particular merit. Helps possessed, however, just enough dramatic power to give life and individuality to the dialogues which he introduced with excellent effect to enliven many of his other books. His first effort in this direction was in *Friends in Council, a Series of Readings and Discourses thereon*, published in 1847 and 1851.

The subject of slavery was one which had a peculiar fascination for Helps. A long essay is devoted to it in the first series of *Friends in Council*. This was subsequently elaborated into a work in two volumes published in 1848 and 1852, called *The Conquerors of the New World and their Bondsmen*. Helps' interest in the subject led him into further investigations into the history of the conquest of America by the Spaniards, and he went to Spain in 1847 for the special purpose of examining the numerous MSS. bearing upon the subject at Madrid. The fruits of these researches were embodied in an historical work based upon his *Conquerors of the New World*, and called *The Spanish Conquest in America, and its Relation to the History of Slavery and the Government of Colonies*. This appeared in four volumes during the years 1855, 1857 and 1861.

From the time of his appointment as Clerk of the Council in 1860 to his death, Helps continued to add to the already considerable list of books, all dealing in one form or another with questions of social, sanitary, or

political reform. Helps edited and wrote an introductory preface to the series of extracts from the Queen's diary, which were published in 1868 under the title *Leaves from a Journal of Our Life in the Highlands*. In 1864 he received the honorary degree of D.C.L. from the university of Oxford. He was made a C.B. in 1871, and K.C.B. in the following year, and died March 7, 1875.

HELSINGBORG, a town of Sweden, province of Skane and län of Malmö, is situated at the narrowest part of the Sound—there only three miles wide—opposite Elsinore, and thirty-two miles north-northwest of Malmö. Population (1900), 24,670.

HELSINGFORS, chief city of the grand-duchy of Finland and the government of Nyland, in the district Helsing, on the Gulf of Finland, 274 miles by rail west of St. Petersburg. Population, (1900), about 80,000.

HELST, BARTHOLOMÆUS VAN DER, was born in Holland at the opening of the seventeenth century, and died at Amsterdam in 1670. His first great picture, representing a gathering of civic guards at a brewery, is variously assigned to 1639 and 1643, and still adorns the town-hall of Amsterdam. His noble portraits of the burgo-master Bicker and Andreas Bicker the younger, in the gallery of Amsterdam, of the same date no doubt as Bicker's wife, lately in the Ruhl collection at Cologne, were completed in 1642. His likeness of Paul Potter at the Hague, executed in 1654, and his partnership with Backhuysen, who laid in the backgrounds of some of his pictures in 1668, indicate a constant companionship with the best artists of the time. It is needless to dwell on the pictures which preceded that of 1648, called the *Peace of Münster*, in the gallery of Amsterdam. The *Peace* challenges comparison at once with the so-called *Night-Watch* by Rembrandt, and the less important, but not less characteristic, portraits of Hals and his wife in a neighboring room.

HELSTON, a municipal and parliamentary borough and market-town of England, county of Cornwall, is situated on the declivity of a hill on the river Cober, nine miles southwest of Falmouth. Population, 9,000.

HELVETII. See SWITZERLAND.

HELVETIUS, CLAUDE ADRIEN, was descended from a family of physicians, the first of whom, John Frederick Schweitzer (Latinized into Helvetius), migrated from Germany to Holland about the year 1649, and became physician to the prince of Orange. His latter years were spent in the study of alchemy. His son, John Adrien, also a physician, went to Paris in the hope of establishing a sale for his father's drugs. He failed in this attempt, but introduced with the greatest success the use of ipecacuanha, then an unknown drug. His son, John Claude Adrien, who embraced the same career with even greater success, was appointed inspector-general of the military hospitals of Flanders and first physician to the Queen Marie Leczinska. His son, Claude Adrien, the future author of *De l'Esprit*, showed as a boy little aptitude for study, but was fond of desultory reading. He was elected a member of the academy of Caen, and when he was only twenty-three years of age had the good fortune to be appointed, at the queen's request, to a place as farmer-general. His philosophical studies ended in the production of his famous book *De l'Esprit*, the composition of which occupied him for more than seven years. It was in 1758 that this book, which was to be the rival of *L'Esprit des Lois*, appeared. It was so far successful at the very outset as to attract immediate attention and to arouse the most formidable opposition, at the head of which was the dauphin, son of Louis XV. The Sorbonne condemned the book; the priests persuaded the court that it was full of the most dangerous doctrines, and the author, ter-

rified at the storm he had raised, wrote three separate retractions; yet, in spite of his protestations of orthodoxy, he had to give up his office at the court, and the book was publicly burned by the hangman. The virulence of the attacks upon the work, as much as its intrinsic merit, caused the whole world to read it; it was translated into almost all the languages of Europe; it was discussed in every literary circle. Yet the *Esprit des Lois* lives, and is still studied with profit, while *De l'Esprit* has long since been forgotten. Helvetius died in 1771.

HELVIDIUS PRISCUS lived in the first century, during the reigns of Nero, Galba, Otho, Vitellius and Vespasian. During Nero's reign he was quaestor in the province of Achaia; he was also sent into Armenia in command of a legion, and by his good sense and moderation he succeeded in restoring peace and order in that country. By the provincials he was respected and trusted. His well-known sympathies with such men as Brutus and Cassius occasioned his banishment in 66 A.D., and he lived with his wife, Fannia, in Macedonia, until Nero's death. Having been recalled to Rome by Galba in 68 A.D., he at once impeached Eprius Marcellus, one of the most villainous of the informers, and the very man who had been the accuser of Thræsea Pætus. He was banished, his wife Fannia, whose constancy and virtue are highly commended by his friend, the younger Pliny, going with him into exile. Shortly afterward he was executed by Vespasian's order.

HELVOETSLUYS (in Dutch, *Hellevoëtsluis*), a fortified town of the Netherlands, in the province of South Holland, situated in the south of the island of Voorne-and-Putten, on the shore of the Haringvliet. Population, 5,000.

Helvoetsluys was founded in the seventeenth century. The construction of the dock was decreed by the states of Holland in 1636, and the erection of the fortifications in 1638; but it was not till 1696 that the works were completed. The new harbor soon became an important rendezvous for the Dutch fleet, and in 1688 it was the starting-point of William of Orange's expedition to England.

HELYOT, PIERRE, monastic historian, was born at Paris in January, 1660, and died in 1716.

HEMANS, FELICIA DOROTHEA, was born in Liverpool, September 25, 1793. Felicia, the fifth of seven children, grew up in the wildest seclusion, in a romantic old house by the seashore, and in the very midst of the mountains and myths of Wales. The little Felicia was a lovely, precocious child. Her education was desultory; and she may indeed be said to have educated herself, the only subjects in which she ever received regular instruction having been French, English grammar, and the rudiments of Latin. Books of chronicle and romance, and every kind of poetry she read with avidity; and she studied Italian, Spanish, French, and German sufficiently to be able to read them with ease and enjoyment. In 1808, when she was only fourteen, a quarto volume of her *Juvenile Poems* was published by subscription. The verses having been rather harshly criticised in the *Monthly Review*, the little poetess was for some days in tears; but the muse was soon reawakened. One of her brothers was fighting in Spain under Sir John Moore; and Felicia, fired with military enthusiasm, wrote *England and Spain, or Valour and Patriotism*, which was afterward published and translated into Spanish. Her second volume, entitled *The Domestic Affections and other Poems*, appeared in 1812, on the eve of her marriage to Captain Hemans, which took place in the summer of that year. Her poem entitled *The Restoration of Works of Art to Italy* was published in 1816, her *Modern Greece* in 1817, and in the

following year appeared her volume of *Translations from Camoens and other Poets*.

In 1818 Captain Hemans went to Reme, leaving his wife, shortly before the birth of their fifth child, with her mother at Bronwylla. No further explanation than that it was in the first instance for Captain Hemans' health has ever been offered of this step; there seems to have been then merely a tacit agreement, perhaps on account of their limited means, that they should live for a time apart. Letters were interchanged, and Captain Hemans was often consulted about his children; but the husband and wife remained separate, and indeed never met again. For the next six years her literary industry never flagged. In 1819 she published *Tales and Historic Scenes in Verse*, and in the same year she gained a prize of £50 offered for the best poem on *The Meeting of Wallace and Bruce on the Bank of the Carron*. The poem was published in *Blackwood's Magazine*. In 1820 appeared *The Septic and Stanzas to the Memory of the late King*. In June she won the prize awarded by the Royal Society of Literature for the best poem on the subject of *Dartmoor*, and during the same year she began her play, *The Vespers of Palermo*. She now applied herself to a course of German reading. Körner was her favorite German poet, and her lines on the grave of Körner were one of the first English tributes to the genius of the young soldier-poet. *The Voice of Spring*, one of her best known lyrics, was written in 1823, the same year in which she began to contribute to the *New Monthly Magazine*; and in the summer of 1823 a volume of her poems was published by Murray, containing *The Siege of Valencia*, *The Last Constantine*, and *Belshazzar's Feast*, which last had appeared previously in a collection edited for a charitable purpose by Joanna Baillie. *The Vespers of Palermo* was acted at Covent Garden, December 12, 1823. The play was a failure, and was withdrawn after the first performance. It was acted again in Edinburgh in the following April with greater success. In the same year she wrote *De Chatillon, or the Crusaders*. In 1824 she began *The Forest Sanctuary*, which appeared a year later with the *Lays of Many Lands*, and miscellaneous pieces collected from the *New Monthly Magazine* and other periodicals.

In the spring of 1825 Mrs. Hemans, with her mother and children and an unmarried sister, removed from Bronwylla, which had been purchased by her brother, to Rhyllon, another house belonging to him on an opposite height across the river Clwyd. The contrast between the two houses suggested her *Dramatic Scene between Bronwylla and Rhyllon*. The house itself was bare and unpicturesque, but the beauty of its surroundings has been celebrated in *The Hour of Romance*, *To the River Clwyd in North Wales*, *Our Lady's Well*, and *To a Distant Scene*. Her popularity was spreading, not only in England but in America, where Professor Norton of Harvard university undertook to superintend the publication of a complete edition of her works and to secure to her the profits. Her own health began to alarm her; and though the nature of her illness, which afterward proved heart complaint, was not at first apparent, she was from this time an acknowledged invalid. Her poetry of this date is chiefly religious. Early in 1834 her *Hymns for Childhood*, which had appeared some years before in America, were published in Dublin. At the same time appeared her collection of *National Lyrics*, and shortly afterward *Scenes and Hymns of Life*. She was planning also a series of German studies, to consist of translations from German authors, with introductions and explanatory notes, one of which, on Goethe's *Tasso*, was completed and published in the *New Monthly Magazine* for January, 1834. In intervals of acute suffering she wrote the

lyric *Despondency and Aspiration*, and dictated a series of sonnets called *Thoughts during Sickness*, the last of which, *Recovery*, was written when she fancied she was getting well. Her last poem, the *Sabbath Sonnet*, was dictated to her brother on Sunday, April 26th; she died on the evening of Saturday, May 16, 1835, at the age of forty-one. Many of her poems, such as *The Treasures of the Deep*, *The Better Land*, *The Homes of England*, *Casabianca*, *The Palm Tree*, *The Graves of a Household*, *The Wreck*, *The Dying Improvisatore*, and *The Lost Pleiad*, have become standard English lyrics, and on the strength of these, and others such as these, Felicia Hemans is ranked among the chief British lyrical poets.

HEMEL-HEMPSTEAD, a market-town of England, county of Hertford, twenty-three miles northwest of London. Population, 9,000.

HEMEROBAPTISTS, an ancient Jewish sect, so named from their observing a practice of daily abstinence as an essential part of religion. Epiphanius, who mentions their doctrine as the fourth heresy among the Jews, classes the Hemerobaptists doctrinally with the Pharisees, from whom they differed only in, like the Sadducees, denying the resurrection of the dead.

HEMINGFORD, or HEMMINGFORD, WALTER, a Latin chronicler of the fourteenth century, was a canon regular of the Austin Priory of Gisborough, now Guisborough, in Yorkshire.

HEMIPTERA, an order of the *Insecta* most commonly known by the name of "bugs," and containing the species so well known to infest houses. In their earlier stages they have what is known among naturalists as an incomplete metamorphosis; that is to say, after quitting the egg, and during the two stages of their existence before assuming the perfect form, they move freely about, thus unlike the *Lepidoptera*, etc., whose pupa state, or that preceding the perfection of the insect, is quiescent. When the transformations have been completed, the insect generally possesses four wings. The superior pair, or hemelytra as they are called by authors, are attached to the mesothorax, and are composed of two substances—the basal portion coriaceous, or resembling leather, and the apical one membranaceous, or resembling thin, transparent parchment. The lower pair are attached to the metathorax, and are entirely membranaceous and generally transparent, and capable of being folded when the insect is in repose. This segment of the sternum likewise bears on each side, anteriorly, a more or less reniform-shaped orifice, within which lies a sac containing the fluid or matter from which so many of the *Heteropterous* portion of the order emit a most disagreeable odor. They also possess in all stages a mouth (rostrum) composed of three or more joints formed for suctorial purposes.

The whole of the group is extremely widely distributed, being found in almost every portion of the globe; and they are very varied both in form and in their modes of life—man, animals, birds, insects, and plants being subjected to their attacks. On the Continent they have for a long period engaged the attention of naturalists, but in England little was known of the actual number inhabiting these islands until Douglas and Scott in 1865 published their volume of *British Hemiptera-Heteroptera*. In 1859 Dr. A. Dohrn published what may be considered to be the first whole-world catalogue of the order; and, taking it as a basis, for there is no other approximate list, and adding a reasonable amount of new species collected in each year since that time, their number would amount to nearly 10,500 species, 5,300 belonging to the heteropterous section and the remainder to the second sub-order. Out of these Europe lays claim to at least 3,000, while Great Britain is known to possess not

(fewer than 1,000. There is no record of any one of the species being cosmopolitan (except perhaps the house bug, *Acanthia lectularia*), although some of the species inhabiting England are also to be met with in China and Japan.

HEMLING. See MEMLING.

HEMLOCK is the *Conium maculatum* of botanists, a biennial umbelliferous plant, found wild in many parts of Great Britain and Ireland, where it occurs in waste places, on hedge-banks, and by the borders of fields, and which is also widely spread over Europe and temperate Asia, and naturalized in the cultivated districts of North and South America. It is an erect branching plant, growing from three to six feet high, and emitting a disagreeable smell, like that of mice. The stems are hollow, smooth, somewhat glaucous, green, spotted with dull dark purple, as alluded to in the specific name, *maculatum*. The root-leaves have long furrowed footstalks, sheathing the stem at the base, and are large, triangular in outline, and repeatedly divided or compound, the ultimate and very numerous segments being small, ovate, and deeply incised at the edge. These leaves generally perish after the growth of the flowering stem, which takes place in the second year, while the leaves produced on the stem become gradually smaller upward. The branches are all terminated by compound many-rayed umbels of small white flowers, the general involucre consisting of several, the partial ones of about three short lanceolate bracts, the latter being usually turned toward the outside of the umbel. The flowers are succeeded by broadly ovate fruits, the mericarps (half-fruits) having five ribs which, when mature, are waved or crenated; there are no vitæ or oil-cysts; and when cut across the albumen is seen to be deeply furrowed on the inner face, so as to exhibit in section a reniform outline. The fruits when triturated with a solution of caustic potash evolve a most unpleasant odor.

Hemlock is a virulent poison, but it varies much in potency according to the conditions under which it has grown, and the season or stage of growth at which it is gathered. In the first year the leaves have little power, nor in the second are their properties developed until the flowering period, at which time, or later on when the fruits are fully grown, the plant should be gathered. The wild plant growing in exposed situations is to be preferred to garden-grown samples, and is more potent in dry warm summers than in those which are dull and moist.

The poisonous property of hemlock resides chiefly in the alkaloid *conine* or *conia* which is found in both the fruits and the leaves, though in exceedingly small proportions in the latter. Conine resembles nicotine in its deleterious action, but is much less powerful. No chemical antidote for it is known.

The fruits are the chief source whence conine is prepared. The principal forms in which hemlock is employed are the extract and juice of hemlock, hemlock pulvite, and the tincture of hemlock fruits. Large doses produce vertigo, nausea, and paralysis; but in smaller quantities, administered by skillful hands, it has a sedative action on the nerves. It has also some reputation as an alterative and resolvent, and as an anodyne.

HEMP, *Cannabis sativa*, an annual herb, having angular rough stems and alternate lobed leaves. The bast fibers of *Cannabis* are the hemp of commerce, but under the name of hemp fibrous products from many different plants are often included. Manila hemp or feather fiber is derived from the fibro-vascular bundles of certain monocotyledons.

The hemp-plant, like the hop, which is the other mem-

ber of the same natural order, *Cannabinaceæ*, is dioecious, that is, the male and female flowers are borne on separate plants. The male plant is smaller than the female, and ripens and dies earlier in the summer. The foliage of the female plant is much darker and more luxuriant than that of the male. The leaves of hemp are constituted of five to seven leaflets, the form of which is lanceolate-acuminate, and sharply serrate. The loose panicles of male flowers and the short spikes of female flowers arise from the axils of the upper leaves. The height of the plant varies greatly with season, soil, and manuring: a variety (*C. sativa*; var. *gigantea*) has produced specimens over seventeen feet in height, but the average height of the common sort is about eight to ten feet. The original country of the hemp-plant was doubtless in some parts of temperate Asia, probably near the Caspian Sea. It spread westward through Europe, and southward through the Indian peninsula. Wild hemp still grows on the banks of the Lower Ural and the Volga, near the Caspian Sea. It extends to Persia, the Altai range, and northern and western China. It is found in Kashmir, and on the Himalaya, growing vigorously as far up as 6,000 or even 10,000 feet.

Hemp is grown for three products—the fiber of its stem; the resinous secretion which is developed in hot countries upon its leaves and flowering heads; its oily seeds.

Hemp has been employed for its fiber from ancient times. Herodotus mentions the wild and cultivated hemp of Scythia, and describes the hempen garments made by the Thracians as equal to linen in fineness. Hesiychius says the Thracian women made sheets of hemp. Moschion (about 200 B.C.) records the use of hempen ropes for rigging the ship *Syracusia* built for Hiero II. The hemp plant has been cultivated in northern India from a considerable antiquity, not only as a drug but for its fiber. The Anglo-Saxons were well acquainted with the mode of preparing hemp. Hempen cloth became common in central and southern Europe in the thirteenth century.

The medicinal and intoxicating properties of hemp have probably been known in Oriental countries from a very early period.

The hemp-plant grown in some parts of the United States yields the active resin so freely that less than one grain of the extract is a full dose. But it is as a fiber-producer that the hemp is now being more extensively cultivated in the United States. Hemp seeds were ordered for Plymouth colony as early as 1629, but the greater profit derivable from tobacco has always opposed the development of hemp-growing. The plant is chiefly grown in the States of Kentucky, Missouri, Tennessee, Ohio, Indiana and New York. The produce per acre in the United States is from 700 to 1,000 pounds of fiber, four to six pecks of seed being usually sown.

Although the hemp-plant is grown in India chiefly for the production of its narcotic or intoxicating resin, yet a good deal of true hemp fiber is produced there. It is imported into England, however, chiefly from Russia, the United States, Italy, Holland, Germany, Hungary and Turkey. It is grown in Ireland, and in some parts of England. It thrives well in Algeria. It requires a rich deep soil and heavy manuring, and is an exhausting crop. The male plants are pulled from the end of July to the end of August, the female or seed-bearing plants being gathered in September.

Hemp, as a drug or intoxicant for smoking and chewing, occurs in the three forms of bhang, ganja and charas.

Bhang, the Hindustani *siddhi* or *sabzi*, consists of the dried leaves and small stalks of the hemp; a few fruits occur in it. It is of a dark brownish-green color,

and has a faint peculiar odor, and but a slight taste. It is smoked with or without tobacco; or it is made into a sweetmeat, with honey, sugar and aromatic spices; or it is powdered and infused in cold water, yielding a turbid drink, *sudschi*. *Hashish* is one of the Arabic names given to the Syrian and Turkish preparations of the resinous hemp leaves. One of the commonest of these preparations is made by heating the *bhāng* with water and butter, the butter becoming thus charged with the resinous and active substances of the plant.

Ganja, the guaza of the London brokers, consists of the flowering and fruiting heads of the female plant. It is brownish-green, and otherwise resembles *bhāng*, as in odor and taste.

Charas, or *churrus*, is the resin itself collected, as it exudes naturally from the plant, in different ways. The best sort is gathered by the hand like opium; sometimes the resinous exudation of the plant is made to stick first of all to cloth, or to the leather garments of men or even to their skin, and is then removed by scraping, and afterward consolidated by kneading, pressing and rolling. It contains about one-third or one-fourth its weight of the resin.

Hemp, however consumed, acts in a most strange way upon the nervous system, but its effects differ greatly with races as well as with individuals. Generally the first effect of a small dose is to produce increase of appetite and cheerfulness. Larger doses produce hallucinations, delirium, sleep, and sometimes catalepsy. During the dreamy state induced by an average dose of hashish, the patient becomes the sport of rapidly shifting ideas. Errors of perception as to time and place are a conspicuous characteristic of its effects on the mind. Extract of hemp has been repeatedly tried in modern European medical practice without very consistent or satisfactory results. It has antispasmodic and anodyne characters, and has been employed in tetanus, spasmodic cough, hydrophobia, and some forms of mania. It is a quieter of the nervous system, but does not cause constipation, check the appetite, nor diminish the secretions like opium.

Hemp is largely used in Eastern countries as an intoxicant and narcotic—probably by nearly 300,000,000 of the human race. The amount consumed cannot be estimated.

The ripe seeds, really fruits, being nuts or achenes of the hemp plant, contain about 34 per cent. of oil and 16 of albuminoids. When the crushed seeds have been submitted to pressure, the residual cake is found to contain about 7 per cent. of oil. The value of hemp cake as a cattle-food is lessened by its purgative property. The seeds are much used as a food for singing birds. A hundred parts of the seed yield from seventy to seventy-five of cake and twenty-five to thirty of oil. This oil has drying properties, though it is in this respect much inferior to linseed oil. Its specific gravity is .9307. The seeds are roundish ovate, about one-eighth inch in length, and of a dark gray color, with a pale ash-colored network of surface markings.

HEMS, HOMS, or HUMS, a town of Syria, about sixty-three miles by road northeast of Tripoli (Tarābulus) situated 1,312 feet, according to Cernik, above the level of the sea, on the eastern side of the valley of the Nahr el Asy or Orontes, which about four miles further down forms the lake of Hems, Atini, or Kabas. The population is estimated at from 20,000 to 40,000, and about 7,000 are Christians.

HEMSTERHUIS, FRANÇOIS (1720-1790), writer on æsthetics and moral philosophy, was born at Franeker in Holland.

HEMSTERHUIS, TIBERIUS (1685-1766), philologist and critic, was born at Groningen in Holland.

HÉNAULT, CHARLES JEAN FRANÇOIS (1685-1770), French historian, was born in Paris. The literary work on which Hénault bestowed his chief attention was the *Abrégé Chronologique*, first published in 1744 without the author's name. It is a model of its kind, and is valuable both for popular use and as a work of reference. In the compass of two volumes he has comprised the whole history of France from the earliest times to the death of Louis XIV. His information is for the most part drawn from original sources, and for such a work the number of errors committed by Hénault was remarkably small.

HENBANE is the common name of the *Hyoscyamus niger*, a Solanaceous plant indigenous to Britain, found wild in waste places, and cultivated for medical use. It occurs also in central and southern Europe and in western Asia, and has long been naturalized in the United States. There are two forms of the plant, an annual and biennial, which spring indifferently from the same crop of seed. Both the leaves and the seeds are employed in pharmacy. In small and repeated doses henbane has been found to have a tranquillizing effect upon persons affected by severe nervous irritability. In poisonous doses it causes loss of speech, distortion, and paralysis. In the form of extract or tincture it is a valuable remedy in the hands of a medical man, either as an anodyne, a hypnotic, or a sedative. The extract of henbane is rich in nitrate of potassium and other inorganic salts. The smoking of the seeds and capsules of henbane is noted in books as a somewhat dangerous remedy adopted by country people for toothache. Accidental poisoning from henbane occasionally occurs.

HENDERSON, the county seat of a county of the same name in the northwestern part of Kentucky, lies on the Ohio river, ten miles south of Evansville, Ind. It is the seat of a large trade, both by the river and several lines of railway, but is especially noted as the center of a rich tobacco-growing country, there being over a score of factories and warehouses in the city devoted to this industry. Henderson also possesses railway shops, flour and saw mills, and manufactories of farming implements. The surrounding country is richly supplied with hardwood timber and coal. In 1900 Henderson's population was 10,272.

HENDERSON, ALEXANDER, a celebrated Scottish ecclesiastic, was born in 1583. He was educated at the University of St. Andrews, where he was appointed professor of rhetoric and philosophy and questor of the faculty of arts in 1610. A year or two after this he was presented to the living of Leuchars by Archbishop Gladstones. As Henderson was forced upon his parish by an archbishop, and as he was known to sympathize with Episcopacy, his settlement was at first extremely unpopular; but he subsequently changed his views, and became a Presbyterian in doctrine and church government, and one of the most esteemed ministers in Scotland. On March 1, 1638, the public signing of the "National Covenant" began in Greyfriars Church, Edinburgh. Henderson is mainly responsible for this document; and he seems always to have been applied to when any manifesto of unusual ability was required. Henderson's next public appearance was in the famous Assembly which met in Glasgow on November 21, 1638. In 1640 Henderson was elected by the town council rector of Edinburgh university—an office to which he was annually reelected till his death. In 1643 the "Solemn League and Covenant," after undergoing some slight alterations, passed the two Houses of Parliament and the Westminster Assembly, and thus became law for the two kingdoms. By means of it Henderson has had an extraordinary influence on the history of Great Britain. As Scottish commissioner

to the Westminster Assembly, he was in England from August, 1643, till August, 1646; and he died August 19, 1646.

HENDERSON, EBENEZER, Scottish dissenting minister, and theological and miscellaneous writer, was born at the Linn near Dunfermline, November 17, 1784, and died at Mortlake, May 17, 1858.

HENGSTENBERG, ERNST WILHELM (1802-1869), for more than forty years one of the most conspicuous and able champions of the strictest Lutheran orthodoxy, was born at Fröndenberga, a Westphalian village near Hamm, and not far from the Ruhr.

HENKE, HEINRICH PHILIPP KONRAD (1752-1809), a learned German theologian of the broad school, best known as a writer on church history, was born at Hehlen, Brunswick, on July 3, 1752, was educated at the gymnasium of Brunswick and the university of Helmstädt, and from 1778 until his death, which occurred on May 2, 1809, held a professorship of theology in that university.

HENLEY, JOHN, an eccentric clergyman of the last century, commonly known as "Orator Henley," was born August 3, 1692, at Melton-Mowbray, England, and died in 1759.

HENLEY-ON-THAMES, a market town of Oxfordshire, England, is situated on the left bank of the Thames and at the terminus of a branch of the Great Western Railway. Henley is a favorite summer resort, and also possesses some trade in corn, flour, malt and timber. It is celebrated for the Henley Royal Regatta, the principal gathering of amateur oarsmen in England, which usually takes place in July. The population of the parish is 4,000.

Henley existed at a very early period, and according to some authorities was a Roman station. It obtained a charter of incorporation from Elizabeth, in which it is named *Hanleygang* or *Hanneburg*. In 1643 it was occupied by the Parliamentary forces, who successfully repelled an attack made upon them by the Royalists.

HENNA is the Persian name for a small shrub found in the East Indies, Persia, the Levant, and along the African coast of the Mediterranean, where it is frequently cultivated. It forms a slender shrubby plant of from eight to ten feet high, furnished with opposite oval-lance-shaped smooth leaves, which are entire at the margins, and bears small white four-petaled sweet-scented flowers disposed in panicles. The four spreading petals are obovate, and furnished with claws; and alternating with them are eight stamens approximating by pairs.

Henna or Henné is of ancient repute as a cosmetic. This consists of the leaves of the *Lawsonia* powdered and made up into a paste; this is employed by the Egyptian women; and also by the Mahomedan women in India, to dye their finger nails and other parts of their hands and feet of an orange red color, which is considered to add to their beauty. The color lasts for three or four weeks, when it requires to be renewed. Henna is also said to have been held in repute among the Hebrews, being considered to be the plant referred to as camphire in the Bible.

HENNEBONT, a town of France, arrondissement of Lorient, and department of Morbihan, is situated on the Blavet, not far from its mouth, and twenty-five miles west-northwest of Vannes. Population (1890), 5,000.

HENNEQUIN, PHILIPPE AUGUSTE, French painter, was a pupil of David. He was born at Lyons in 1763, distinguished himself early by winning the "grand prix," and left France for Italy. The disturbances at Rome during the course of the Revolution obliged him to return to Paris, where he executed the *Federation of July*

14th. In July, 1794, he was accused before the revolutionary tribunal and thrown into prison. Hennequin escaped, only to be anew accused and imprisoned in Paris, and after running great danger of death, seems to have devoted himself thenceforth wholly to his profession. At Paris he finished the picture ordered for the municipality of Lyons, and in 1801 produced his chief work, *Orestes Pursued by the Furies*. He was one of the four painters who competed when in 1802 Gros carried off the official prize for a picture of the *Battle of Nazareth*, and in 1808 Napoleon himself ordered Hennequin to illustrate a series of scenes from his German campaigns, and commanded that his picture of the *Death of General Salomon* should be engraved. After 1815 Hennequin retired to Liège, and there, aided by subventions from the government, carried out a large historical picture of the *Death of the Three Hundred in Defense of Liège*—a sketch of which he himself engraved. In 1824 Hennequin settled at Tournay, and became director of the academy; he exhibited various works at Lille in the following year, and continued to produce actively up to the day of his death, which took place in May, 1833.

HENNERSDORF, or SEIFHENNERSDORF, a manufacturing village of Saxony, in the circle of Bautzen, and twenty miles south-southeast of the town of that name. Population, 7,000.

HENRIETTA MARIA, queen of Charles I. of England, born November 25, 1609, was the daughter of Henry IV. of France. When the first overtures for her hand were made on behalf of Charles, prince of Wales, in the spring of 1624, she was little more than fourteen years of age. Her brother, Louis XIII., only consented to the marriage on the condition that the English Roman Catholics were relieved from the operation of the penal laws. When therefore she set out for her new home in June, 1625, she had already pledged the husband to whom she had been married by proxy on May 1st to a course of action which was certain to bring unpopularity on him as well as upon herself.

When the Scottish troubles broke out, she raised money from her fellow Catholics to support the king's army on the borders in 1639. During the session of the Short Parliament in the spring of 1640, the queen urged the king to oppose himself to the House of Commons in defense of the Catholics. When the Long Parliament met, the Catholics were believed to be the authors and agents of every arbitrary scheme which was supposed to have entered into the plans of Strafford or Laud. Before the Long Parliament had sat for two months, the queen was urging upon the pope the duty of lending money to enable her to restore her husband's authority. She threw herself heart and soul into the schemes for rescuing Strafford and coercing the parliament. The army plot, the scheme for using Scotland against England, and the attempt upon the five members were the fruits of her political activity.

In the next year the queen effected her passage to the Continent. In February, 1643, she landed at Burlington Quay, placed herself at the head of a force of loyalists, and marched through England to join the king near Oxford. After little more than a year's residence there, on April 3, 1644, she left her husband to see his face no more. At Exeter she gave birth to her youngest child, who was one day to be duchess of Orleans, and to negotiate the treaty of Dover. Henrietta Maria found a refuge in France. Richelieu was dead, and Anne of Austria was compassionate. As long as her husband was alive the queen never ceased to encourage him to resistance.

When after the Restoration she returned to England, she found that she had no place in the new world.

She received from parliament a grant of £30,000 a year in compensation for the loss of her dower-lands, and the king added a similar sum as a pension from himself. In January, 1661, she returned to France to be present at the marriage of her daughter Henrietta to the duke of Orleans. She died on August 31, 1666, at Colombe, not far from Paris.

HENRY I., king of England, fourth and youngest son of William the Conqueror and Matilda of Flanders, was born in 1068. Local tradition fixes his birthplace at Selby in Yorkshire. Condemned, by the division of the Conqueror's territories, to a position of inferiority to his two brothers, he used his legacy to improve that position. Nevertheless, in the treaty between William and Robert made in 1091, he was excluded from the succession, and soon afterward was deprived of his lands in Normandy.

The treatment he met with from Robert was not likely to make him support the terms of the treaty of 1091. Immediately after the death of Rufus, he rode to Winchester, and seized the royal hoard in that city. Next day (August 3, 1100) he was elected king by such of the witan as were present, and on Sunday, August 5th, he was crowned at Westminster. Before the year was out he married Matilda, daughter of Malcolm and Margaret, and great-granddaughter of Edmund Ironside, a step which greatly strengthened his otherwise insecure title to the crown. The alliance thus contracted with the church and the nation was his constant support in the struggle with his brother and his unruly vassals, which began immediately. It resulted in the conquest of Normandy, the temporary suppression of feudalism, and the consolidation of royal power on both sides of the Channel. Robert, as soon as he returned from the Holy Land, attempted with the aid of a conspiracy in England to wrest the crown from the usurper. He landed at Portsmouth (August 1, 1101), but before a blow was struck the brothers came to terms. Robert recognized Henry as king of England, and returned to Normandy. Secure in England, Henry carried the war into the enemy's country. His brother's misgovernment gave him both pretext and opportunity. After two or three expeditions, the struggle was brought to a close by the battle of Tenchebrai (September 28, 1106), in which Robert was taken prisoner. He remained in captivity till his death in 1134, and Normandy passed into the possession of the English king. This conquest at once brought Henry into collision with France. A war with France (1111-1113) ended in a peace which brought some advantages to Henry. Louis gave up his claim to the sovereignty of Maine and Brittany, and Henry was able to carry his old opponent, Robert of Belesme, to England, where he was imprisoned for the rest of his life. Henry had already, though in vain, attempted to secure the aid of Flanders by two treaties with Count Robert (1103, 1108). He now sought a mightier ally in the emperor Henry V., to whom he married his daughter Matilda (January 7, 1114). Another war with France, which broke out in 1116, and in which Louis took up the cause of William, son of Robert, against his uncle, was marked by the battle of Noyon (1119). At a council at Rheims (1116) Louis accused Henry before Pope Calixtus of rebellion and usurpation. Henry, however, pleaded his own cause before the pope at Gisors so persuasively that Calixtus brought about a peace between the two kings (1120) on the basis of a mutual restoration of conquests. During the war Henry had suffered a severe loss in the death of his queen Matilda. He now felt it more than ever necessary to take measures for securing the succession to his only son William, who married Matilda, daughter of Fulk of Anjou, an alliance by which Henry hoped to turn a

dangerous foe into a firm friend, and to secure at least the chance of a rich inheritance. All these hopes were, however, shattered by the death of William (1120). Deprived of an heir to his throne, Henry now married Adeliza, daughter of Godfrey, count of Louvain (1121), but the marriage proved childless. Shortly afterward another rebellion, headed by Count Walern of Meulan, broke out in Normandy (1123). The terrible vengeance taken by Henry, together with the death of William, son of Robert, in 1128, seems to have finally crushed the opposition in Normandy. The death of Duke Robert in 1134 removed the last object round which the schemes of rebellion or the intrigues of France could center. Meanwhile Henry had recalled his daughter Matilda, now a widow, from Germany. In default of an heir to the throne, he made the witan swear to accept her as Lady of England and Normandy (Christmas, 1126). Next year he gave her in marriage to Geoffrey, son of Fulk, count of Anjou, hoping thereby to secure the objects frustrated by the death of his son.

Over Scotland, Ireland and Wales a sort of ecclesiastical supremacy was recognized. On the northern frontier there was peace throughout the reign; on the western there was more disturbance. Henry settled a colony of Flemings in Pembroke (1111), and made two expeditions into Wales (1114, 1121), in one of which he received the submission of several Welsh princes. The profound peace which England enjoyed for a period of thirty-four years is the best testimony to Henry's merits as a king. As a man his character is not admirable, nor yet wholly to be condemned. He was hard, merciless, and unforgiving, but not wantonly cruel. Regarded as the "Lion of Justice" by his people, and bitterly regretted after he was gone, he was not a popular king. He died, after bequeathing his crown to his daughter Matilda, near Rouen (December 1, 1135). His body was carried to England and buried in the abbey he had founded at Reading.

HENRY II., king of England, son of Geoffrey, count of Anjou, and Matilda, daughter of Henry I., was born at Le Mans, March 5, 1133. He was left in France during the first part of his mother's struggle with Stephen, but was sent over to England in 1141. On his return to Normandy (1151), Louis VII. conferred the duchy upon him, and later in the year he became, by his father's death, count of Anjou. In 1152 he married Eleanor of Aquitaine, and added Poitou and Guienne to his dominions. He again went to England in 1153, and the great position he had won on the Continent turned the scale in his favor. After a short struggle Stephen consented to negotiate. By the treaty of Winchester (November 7, 1153) it was settled, among other things, that Stephen should reign undisturbed during the rest of his life, and that Henry should succeed him. A year later Stephen died, and Henry took quiet possession of the throne. He was crowned on December 19, 1154, and at once issued a charter of liberties, in which he confirmed the charter of Henry I.

His reign falls into three main periods. During the first Henry was occupied in restoring and maintaining order. The second is that of the quarrel with Becket. The third is for the most part a period of rebellion and trouble, the consequences of that quarrel. In 1156 Henry was able to go to France, where his brother Geoffrey was causing trouble by his claim to Anjou. He had to subdue him by force of arms, after which he allowed him to be chosen count of Nantes. He then exacted homage from his Continental vassals, and himself did homage to Louis VII. An unsuccessful expedition to Wales followed. In 1158, on his brother Geoffrey's death, Henry secured his inheritance. At the same time he betrothed his second son Henry (the eld-

rst, William, being dead) to Margaret, daughter of Louis. Next year he made an attack upon Toulouse, which he claimed in right of his wife, but after some successes retired, owing to the opposition of the French king. In a peace made soon after, he retained Cahors, but gave up his claim to the rest of the county. Hostilities between him and Louis were, however, more or less continuous during this time, in spite of the efforts of Alexander III. In January, 1163, Henry returned to England after five years' absence, and his quarrel with Becket immediately began.

Becket had been consecrated archbishop of Canterbury in June, 1162. He at once resigned his temporal offices, and demanded the restitution of land alienated from his see. At a council at Woodstock he refused to pay the tax of two shillings per hide of land demanded by the king. A little later the struggle was removed to still more dangerous ground. Becket refused his consent to the king's proposal for settling the dispute between the temporal and spiritual courts. Upon this Henry asked him and the bishops whether they would abide by the ancient customs of the realm. So vague a question met with an evasive answer. The bishops would only consent "saving their order." However, at the council of Clarendon (January, 1164) the disputed customs were drawn up in the form of sixteen constitutions, and after considerable hesitation accepted by Becket. He nevertheless got absolution from the pope, who refused to confirm the constitutions. Henry now attacked Becket with a series of charges connected with his chancellorship, the result of which the latter evaded by leaving England. Henry took possession of the see, and expelled Becket's friends and relations. He also obtained possession of Brittany for his son Geoffrey, and betrothed Richard to Alice, daughter of Louis. With the object of securing the succession he had his son Henry crowned by the archbishop of York at Westminster (June, 1170). The young king's wife was not crowned with him. Louis, taking this as an insult, invaded Normandy, and only made peace with Henry on condition that he would restore Becket to favor. A meeting between the king and the archbishop ended in a compromise, and the latter returned to England. His first step was to suspend the archbishop of York and other bishops who had taken part in the coronation of the young king, and Henry, on hearing of this, uttered the angry words that led to Becket's murder. The pope was, however, in too critical a position to quarrel seriously with Henry. Negotiations between them ended in a meeting with the legates at Avranches (1172), in which Henry received absolution, and promised to abolish all the bad customs introduced during his reign. He had employed the interval in making an expedition to Ireland, and appropriating the conquests made by Strongbow a few years before.

The ecclesiastical quarrel seemed to have died away, but its consequences were felt in the great rebellion of 1173. A confederacy was organized by the French king, the count of Flanders, the king of Scotland, and Henry's sons, with the object of placing the young Henry on his father's throne. The first campaign was indecisive, but on the whole favorable to the king. In view of a general attack which was to be made next year, Henry crossed over to England and did penance at Becket's tomb. Fortunately his justiciar, De Lucy, captured the Scotch king at Alnwick, and the rebellion in England was speedily put down. William the Lion was forced to buy his release by doing homage to Henry; the other confederates made peace; and Henry was left stronger than ever. He at once proceeded to secure his position by further legislative enactments, and henceforward he had no trouble in England. But

he was involved in constant difficulties with his sons and with the French king, owing to the mutual jealousies of the former and the intrigues of the latter, to which Henry's partiality for his youngest son John and his refusal to allow the marriage of Richard with Alice gave rise. A war between the brothers in 1183 was brought to an end by the death of the younger Henry in the same year. The feud broke out again in 1184, and continued at intervals, in spite of the death of Geoffrey in 1186, to the end of the reign. At length Henry's apparent intention to name John as his successor forced Richard to ally himself with Philip II., and in the war that followed Henry was beaten at all points. He was forced to make a disgraceful peace, the terms of which, together with the discovery that John was among his enemies, broke his heart. He died at Chinon, July 6, 1189, and was buried at Fontevraud.

HENRY III. (1207-1272), king of England, eldest son of John and Isabella, was born on October 1, 1207, and was just nine years old on his father's death. Ten days after that event he was crowned at Gloucester (October 28, 1216). His long reign falls into four periods—that of the regency, ending with the fall of De Burgh; that of government by favorites, which led to the Mad Parliament; the period of the Barons' War; and the short period between the close of the war and Henry's death. At his accession the whole country was in rebellion, and Louis with his Frenchmen held the east and south.

The bad promise of Henry's youth was amply redeemed in the events of the next twenty-six years. Under the influence of Peter des Roches, foreigners began to flock to the court, and even foreign mercenaries were introduced into England. Richard, earl marshal, who openly rebuked the king for this conduct, was outlawed, but other barons took up his cause, and collisions between them and the king's troops took place. Civil war appeared imminent, when Archbishop Edmund persuaded Henry to dismiss Peter des Roches, and the danger was avoided for the time (1234). But the king's partiality for foreigners was a constant source of discontent. In 1256 he married Eleanor of Provence. In 1238 Henry married his sister Eleanor to Simon de Montfort, an event which nearly produced an outbreak. Resistance already centered in the Great Council, which in 1236 had declined "to change the laws of England," and supported the bishop of Chichester in his refusal to give up the great seal at the king's demand. Henry's personal extravagance caused him much embarrassment, and the extortions of the papal see pressed heavily on the church. In 1242 the barons refused to give the aid demanded by the king for another expedition to Poitou, and when they met again after his return, they joined with the clergy in a general protest against his misgovernment (1244). Henry found means of evading the demand. Hitherto his brother Richard, earl of Cornwall, had been the leader of the opposition, but Simon de Montfort, earl of Leicester, was now becoming the center of constitutional resistance. Two mistakes on the part of Henry brought matters to a crisis. He had conferred the government of Gascony on De Montfort in 1248, and the latter had reduced the province to obedience. But accusations made against him found ready audience with the king, who feared and disliked his brother-in-law. The result was a bitter quarrel (1252), which Henry followed up by superseding De Montfort in his government, and sending his eldest son Edward to take his place. This had the effect of throwing the earl once for all into the arms of the national party.

A parliament which met at Westminster (April, 1258) forced Henry to promise reform, and elected a commit-

tee of twenty-four to act for the king till a complete scheme could be drawn up. On June 11th the assembly, called afterward the Mad Parliament, met at Oxford. A council of fifteen, of whom two-thirds were on the baronial side, was appointed, who, together with twelve representatives of the "community," were to take charge of the government and meet in parliament thrice a year. These reforms, together with certain general enactments, went by the name of the Provisions of Oxford. The king's authority was completely superseded, and the rule of baronial oligarchy established. But beyond this the baronial government did nothing. The nation testified its disappointment, and a quarrel took place between the earls of Leicester and Gloucester, which divided the baronial party. The king took advantage of this state of affairs, and in 1261 obtained absolution from the Provisions at the hands of the pope. He then fortified the Tower, deposed the baronial justiciar, and soon began to rule as before. In this crisis the baronial party made a bid for popular favor by summoning representatives of the counties to a parliament, but the reaction was for the time complete, and Henry had leisure to go to France in order to win over Louis IX. to his side. In 1263 hostilities broke out on the Welsh border, and the barons seized the opportunity to renew their attack on the king. After some months of desultory warfare it was agreed to submit to the arbitration of Louis. That king, in the Mise of Amiens, decided in favor of Henry, and annulled the Provisions. Leicester at once appealed to arms. The battle of Lewes (May 14, 1264) was a complete victory for him, and put the king and his eldest son into his hands. For a time he was master of the country, but the party he headed was not that which had been dominant six years before, and Henry now had many adherents among the greater barons. Nevertheless, for more than a year he and his son remained practically prisoners in the hands of De Montfort. Edward's escape (May, 1265) caused an immediate renewal of the war, and at the battle of Evesham (August 4, 1265) De Montfort was killed, and Henry set free. Two years later the war was practically concluded by the capture of Kenilworth. Henry had little to do with the conduct of the war, and acquiesced in the arrangements made by his son for the pacification of the country. His triumph was, however, complete, and for the rest of his reign the kingdom was at peace. He died on November 16, 1272.

HENRY IV., king of England, only son of John of Gaunt and Blanche, daughter of Henry, duke of Lancaster, was born in 1366. At the age of fifteen he married Mary Bohun, and in 1385 was made earl of Derby. Two years later he was one of the five lords appellant who impeached the earl of Suffolk and others, and took part in the proceedings of the Merciless Parliament. He acquiesced, however, in Richard's return to power, supported the king in his *coup d'état* of 1397, and became duke of Hereford. His quarrel with the duke of Norfolk led to his banishment shortly afterward, and on his father's death Richard denied him the succession to his title and inheritance (1398). Next year he took advantage of Richard's absence in Ireland to reassert his rights. He landed in Yorkshire, took Bristol, and seized Richard (August 19th) near Conway Castle. At a parliament which met on September 30th, he claimed the throne on the ground of his descent from Henry III., the right of conquest, and the necessity of reform. He was accepted by the parliament; Richard was forced to abdicate; and Henry was crowned (October 13, 1399). The last of his three claims gives the explanation of his policy. He had won favor of the church by pledges in favor of orthodoxy; the

circumstances of his accession and difficulties of his government forced him to make concessions to the House of Commons, which raised that body to a position it did not again attain for more than two centuries. The first part of his reign was occupied with the suppression of the revolts, not only of the defeated party, but also of his own discontented adherents. These troubles were complicated by hostile relations with France, Scotland, and Wales. Charles VI. was inclined to take up the cause of his daughter Isabella, wife of Richard II., and on the death of the latter (February, 1400) demanded her and her dowry back. The duke of Albany in Scotland was hostile to Henry, and Owen Glendower raised a national revolt in Wales. The first attempt at insurrection was made by the earls of Richard's party early in 1409, but their plans were discovered, and their forces crushed piecemeal. Most of the leaders fell victims to popular vengeance. A more serious rebellion was that of the Percies (1403), hitherto Henry's staunchest supporters. Hotspur and his father thought themselves ill requited for their services, and made common cause with Glendower and other malcontents. A junction of the northern army with the Welsh was prevented by the battle of Shrewsbury (July 21, 1403), in which Hotspur was killed. Northumberland submitted and was pardoned. But the danger was not over. The north was still in a state of ferment, the war in Wales went on, and a French fleet ravaged the southern coast with impunity. Henry's vigilance and activity were, however, equal to the task. A plot to carry off the young earl of March (January, 1405) was foiled, and a fresh outbreak in the north was crushed. Scrope, archbishop of York, and Mowbray, earl marshal, who led the rebels, were taken and executed. The king had already got into his power the son of the duke of Albany; he now captured James, the heir-apparent to the Scotch crown, as he was on his way to France; and the murder of the duke of Orleans removed his chief enemy in that country. Thus secured from danger abroad, he put down a final rebellion in the north, drove Glendower back into his mountains, and henceforth had no trouble at home (1408). The late crisis had, however, compelled him to make important concessions to the House of Commons. He promised (1407) to act solely by the advice of a council nominated with their approval, and submitted to the appropriation of his revenue and other limitations. Throughout his reign he was hampered by want of money, and the regular exercise by parliament of the right to withhold supplies gave that body great control over his actions. His foreign policy was not energetic. He had enough to do at first to defend his coasts, and though he afterward seized the opportunity afforded by civil war to invade France (1411), his efforts were in general confined to strengthening his dynasty by foreign marriages. In his later years he was a confirmed invalid, and had to intrust much power to his eldest son, with whom he was not always on the best of terms. He died on March 20, 1413, and was buried at Canterbury.

HENRY V., king of England, eldest son of Henry IV. and Mary Bohun, was born August 19, 1387. Early bred to arms, his first military effort was not successful, for at the age of thirteen he commanded an expedition to Wales which was defeated by Glendower. Three years later he was present at the battle of Shrewsbury, and in 1408 he revenged himself on Glendower by driving him back to Snowdon. At the same time his position in the council, at the head of which he appears after 1410, gave him experience in affairs, and proves the confidence already felt in his political ability. The stories of his youthful extravagance and dissoluteness are unfounded, and, as the above facts show, improba-

ote. Although his father appears to have been jealous of his popularity, he was practically at the head of affairs for some years before the death of Henry IV. Three weeks after that event he was crowned (April 9, 1413), and entered upon his inheritance with the goodwill of all classes of the nation. His persecution of heretics caused a conspiracy, which was discovered and put down with some severity (January, 1414). Sir John Oldcastle, the head of the Lollards, was condemned to be burned, and though he escaped for the time, he was again taken in 1417, and put to death. Henry's orthodoxy brought him into connection with the emperor Sigismund, then engaged in settling the affairs of the church at the council of Constance, and his assistance was very instrumental in the healing of the great schism. But the great work of his life was the conquest of France. It was with this object that he issued a kind of general amnesty on his accession, and appealed to the nation as a whole to support him. War was resolved on by parliament, and Henry laid claim to the French crown. This demand was afterward reduced to one for all the districts which the English kings had ever held in France. Such claims as these, of course, precluded all negotiation, and on August 14, 1415, the English army landed at Havre. Harfleur was taken, but the English losses were so great that Henry resolved to retreat to Calais. On October 25th the French army that opposed his march was cut to pieces at Agincourt. The next two years were spent in preparations for continuing the war. In 1417 Henry again invaded France, took Rouen (1419), and with the assistance of the Burgundian party forced Charles VI. to grant his demands. By the treaty of Troyes (1420), it was arranged that he should marry Catherine, take the government in hand at once, and succeed on Charles' death. This disgraceful treaty had, however, the effect of reviving the national party in France, and during Henry's absence in 1421 the English began to lose ground. He hurried back to France, but before he had time to recover his position, he died at the castle of Vincennes, August 31, 1422.

HENRY VI., king of England, only son of Henry V. and Catherine of France, was born on December 6, 1421, and was therefore only eight months old at his father's death. He can hardly be said ever to have reigned, for his long minority passed into another kind of tutelage, during which the influence of his wife and favorites prepared for civil war. Ten years of anarchy culminated in his dethronement, and ten years more of wandering and imprisonment fill the interval between that event and his death. The chief interest of the first thirty years of his life lies in the decay of English power in France; that of the last twenty is to be found in the civil wars which resulted from the misgovernment of the preceding period. Although the English had lost some ground toward the end of Henry V.'s reign, their position, when the duke of Bedford undertook the task of continuing his brother's work, was very favorable. They held the north and center of France, while Burgundy held the eastern districts. The alliance with Duke Philip was strengthened by a marriage between his sister Anne and the duke of Bedford. The Scotch king, James I., was released from captivity, in order that England might be relieved from danger on that side. Thus strengthened, Bedford was able to apply himself vigorously to the conquest of France, toward which the battle of Verneuil (1424) was an important step. But the English cause had already received its first great blow in the marriage of the duke of Gloucester with Jacqueline of Hainault, which destroyed the good understanding between Burgundy and England. Bedford for the time managed to stave off the quarrel,

and after renewing his union with Burgundy, laid siege to Orleans, the key of southern France. The capture of the town seemed certain, when the appearance of Joan of Arc turned the scale. The relief of Orleans (1429) was followed by other French successes, and by the coronation of Charles VII. at Rheims. The capture of Joan did little for England, for the spirit she had inspired survived her loss, and her death (May, 1431) only nerved the French to fresh efforts. It was in vain that Bedford had Henry crowned at Paris (December 17, 1431). The young king remained in France nearly two years (April, 1430, to February, 1432), but his presence did not turn the tide of French success. On the side of England the supply of men and money was falling short, while on that of France a new type of commanders was coming to the front, who were not inclined to repeat the disastrous blunders of Crécy and Agincourt. Bedford's death (September 14, 1435) finally destroyed all hope of recovery in France. Burgundy at once made peace with Charles VII., and the English commanders who succeeded Bedford were constantly defeated. Paris was retaken; Normandy overrun. Repeated efforts on the part of England led only to further exhaustion. Negotiations for peace led in 1444 to a truce, during which Henry was married (April 22, 1445) to Margaret, daughter of René of Anjou. It was hoped that this marriage, together with the cession of Anjou and Maine, would lead to a permanent peace, and save Normandy and Guienne. But though Anjou and Maine were actually surrendered in 1448, the truce was broken next year, and before the end of 1450 the whole of Normandy was lost. In 1451 Guienne was reconquered by the French, and in 1453 Calais alone remained to England. The war was practically at an end.

Its conclusion coincides with the period when the two parties that divided England were just about to appeal to arms. The civil war was in great measure the result of the defeats abroad, as those defeats themselves were in part the consequence of discord at home. The coronation of the young king at Westminster (November 6, 1429) put a formal end to the regency of Bedford and Gloucester, but not to the intrigues of the latter. The House of Commons was unable to interfere with any effect; the Lords were mostly engaged on one side or the other. The death of Bedford removed the only guarantee of peace, and Gloucester attacked Beaufort with more virulence than ever after his brother's death. In the midst of these troubles Henry VI. came of age (1442.)

The work of government was left mainly in the hands of Cardinal Beaufort and the earl of Suffolk, who did their best to secure peace with France. On the other side the dukes of Gloucester and York headed the opposition, and took up the cry of reform, with the object of infusing vigor into the government at home and abroad. Suffolk, however, won a great victory in the truce with France (1444); and through the young queen Margaret, whose marriage was chiefly due to his exertions, he obtained complete influence over the king. The suspicious death of Gloucester (1447), followed in six weeks by the death of his rival Beaufort, together with the appointment of York to the governorship of Ireland, left Suffolk master of the situation. But the complete failure of his foreign policy brought about his fall (1450). The king in vain attempted to save him, and by so doing shared his unpopularity, while the partial concessions he made to the demands of the rebels under Jack Cade only postponed the inevitable outbreak. The duke of York now made himself the mouthpiece of popular discontent. When the final loss of France had exhausted the country's patience, and the birth of an heir to the throne had destroyed his hope of the succession, he took advantage of Henry's mental derangement to claim the protector-

ate (1453). It was granted him early next year, but in 1455 the king recovered his senses, and York was deprived of power. Unable to endure this he marched on London, and on May 22, 1455, the Wars of the Roses began in the battle of St. Albans. The effect of the battle was to bring the queen to the front as the leader of the royalists, and to make the quarrel between her and York irreconcilable. During the four years of uneasy quiet which followed the first collision, Henry tried hard to keep the peace. But all his efforts were vain. When the struggle broke out anew, and the Yorkists won the battle of Northampton, he was forced to consent to an arrangement by which his son was excluded from the succession and York recognized as heir to the kingdom (1460). The settlement was of short duration. York himself lost his life at Wakefield, but his son seized the crown and was acknowledged king (March 4, 1461). The battle of Towton brought the struggle to an end for ten years, and the capture of Henry in 1465 seemed to secure Edward IV. on the throne. Five years later a sudden revolution hurled him from it, and restored the wretched prisoner for a while to liberty, but the battle of Barnet destroyed his hopes again. He had time to know that his son had died at Tewkesbury, that his wife was a prisoner, and that his cause was finally lost, before death released him from captivity on May 21, 1471.

HENRY VII. (1456-1509), king of England, was the founder of the Tudor dynasty. On his mother's side Henry belonged to the illegitimate branch of the house of Lancaster, being descended from John of Gaunt and Catherine Swinford, and it was only in the absence of nearer heirs that he was accepted as the representative of that house. On the father's side he was sprung from the marriage of Owen Tudor, a Welsh gentleman, with Catherine, widow of Henry V., and this family name became the name of the line of kings which he founded. On the complete overthrow of the Lancastrians, especially after Richard had won the throne by putting his nephews out of the way, Henry, under the name of the earl of Richmond, appeared as the center of the opposition. He landed at Milford Haven in order to profit by the good will of his kinsmen the Welsh, and marching into Leicestershire defeated Richard at the battle of Bosworth, thus ending the Wars of the Roses (1485). Soon after he married Elizabeth, daughter of Edward IV., and so the White Rose and the Red were united. Henry, however, was not allowed to enjoy the crown in peace. Two pretenders, one after another, led a rising against him. Lambert Simnel, personating the earl of Warwick, son of the duke of Clarence, gathered the Yorkists about him in Ireland; and, landing in Lancashire, advanced as far as Stoke in Staffordshire, where he was defeated and made captive (1487). Next arose Perkin Warbeck, a Fleming, who, pretending to be one of the princes murdered by Richard in the Tower, received much countenance abroad and in Scotland, and had many supporters among the discontented at home. But when he ventured to land in Cornwall, he was captured, and finally executed (1499). These risings troubled the reign of Henry, but did not shake his throne. He ruled with a firm hand; he took care to repress the nobles, already almost exterminated in the civil war, in this case continuing the policy of Edward IV.; he put down the practice of maintenance, by which they kept bodies of retainers ready to support them in battle, and in every way sought to concentrate in the person of the king the whole power of the nation. Henry was a parsimonious and calculating ruler, who avoided war, gained by diplomacy what other sovereigns attempted by force, kept a well-filled treasury, and made two brief

expeditions into France the occasion of amassing additional wealth. His avarice led him even to revive old and forgotten statutes, and to exact heavy fines from those who had transgressed them, in which evil work he was assisted by the two well-known lawyers, Empson and Dudley. His reign is marked also by two marriage arrangements which had great influence on subsequent history. His son Arthur was wedded to Catherine of Aragon. When Arthur died in 1502, a few months after the marriage, Catherine remained in England in order to be united to the younger son, Henry, though the nuptials did not take place till after his accession to the throne. The other marriage was that of the young princess Margaret to James IV. of Scotland (1503), which a century after resulted in the union of the crowns. Henry VII. died in 1509, leaving, it is said, a treasure of two million pounds to his successor.

HENRY VIII., king of England, was born in 1491, being the second son of Henry VII. and of his wife Elizabeth of York. On the death of his elder brother Arthur in 1502, he became heir apparent to the throne. His training under the severe and methodical Henry VII. must have been a very careful one; he was deeply interested in the new learning, and was a most accomplished scholar. During his father's lifetime we hear nothing of the young king except as the destined husband of Catherine of Aragon, the widow of his brother Arthur, a lady six years older than himself. It suited the plans of the old monarchs, their parents, that Catherine should be wedded to Henry, and so she remained in England during the seven years of her widowhood. Henry was only eighteen when the death of his father (1509) left the throne of England vacant, as well as set him free to shape his own career. His first important act was to fulfill the contract imposed upon him by his father to marry Catherine. His ministers, almost without exception, were in favor of the marriage. Henry expressed himself highly delighted with his wife. Catherine was fond of him to excess. The disparity of years was not so marked at that early period; Catherine was amiable, accomplished, of the bluest blood in Europe, closely connected with the most powerful dynasties, a queen of whom England with her then diminished prestige might well be proud. For the time all went well, and no one saw in such a simple event the seeds of a great revolution.

The reign of Henry falls naturally into two periods, separated by the question of the divorce. During the first period Henry is the splendid and jovial king at home; abroad a figure of the first magnitude in the wars and international diplomacies of the time. Both in home and foreign affairs, but particularly the latter, Wolsey was the right hand man of the king, ready, as occasion served, either to transact the whole business of the government, or to be the humble instrument of the king, when the royal hand did actively interfere. In point of fact Henry always was master, and took a keen interest in business. The events of the first period were concerned chiefly with the foreign wars. At home, with the exception of the execution of Empson and Dudley, the instruments of his father's extortion, who suffered however, on a trumped-up charge of treason, nothing important occurred. There were Christmas revels, May festivals, tilting matches, in which Henry always shone victorious, and in which he squandered the treasures of his father. But the serious endeavors of the time were directed abroad; Henry joined his relatives Ferdinand and Maximilian in a league against France. Though Henry took a personal share in the campaign in France of 1513, and won the easy Battle of Spurs, and though Surrey, his general, gained the great victory of Flodden, no substantial result was attained by either war.

Henry was duped and then abandoned by his allies. When he was undeceived, he made peace (1514) with France, which was cemented by the marriage of his youthful sister Mary to the old and worn-out Louis XII. Soon after, when Louis was succeeded by Francis I. (1515), and Charles V. entered on the government of his hereditary dominions (1516), the three monarchs who figure so conspicuously as the contemporaries of the Reformation, and whose doings constitute so much of the history of the sixteenth century, found themselves face to face. With these two and with the successive popes Henry had to do during the rest of his life. Their relations at first were chivalrous and even friendly. Henry never had any chance of success in his canvass for the imperial crown. When it fell to Charles, it made him beyond a doubt the first monarch of the age; his success placed him in open rivalry to Francis; but to Henry, fortunate again, it gave the desirable prospect of being courted by the two rivals, and even of acting as arbiter in their disputes. Henry, however, descended from his lofty position to engage in quarrels which had no concern with the true interests of England. The chimera of French conquest again fascinated him and his people, so that when the false chivalry of the Cloth of Gold had degenerated into war, Henry took the side of Charles. In the campaign of 1523 the English forces advanced to within eleven leagues of Paris, but the war led to no durable and satisfactory result as far as Henry was concerned. The people grew sick of the heavy contributions they were called upon to make, and threatened revolt. After the battle of Pavia (1525), where the French were completely overthrown and their king made prisoner by the armies of Charles, the policy of Henry was completely disturbed. Under these circumstances English policy was forced out of its old groove, and an alliance was made with France. In a short time, moreover, interests and passions of a far more momentous nature emerged. The dilettante politics of Henry's early career were to be superseded by occupations of a tragically earnest nature. Adventurous enterprises abroad were to give place to real interests at home, and the jovial young king was to be transformed into the stern, self-willed, and often cruel revolutionary. The serious and important part of Henry's life therefore is still to come: but before leaving the earlier period it is well to remark that it lasted twenty years, or more than half of his reign; that during these years Henry was popular in the highest degree; and especially that he had gratified the national pride of his subjects by restoring England to a leading position in Europe. This should not be forgotten during the trouble and more questionable events that were to follow.

The year 1528 may justly be fixed as the turning-point of Henry's life. By that time the divorce had become a national and even a European question, and Henry had decisively committed himself to the course which was to result in the separation from Rome. It is not clear when the plan of a divorce began to take shape in Henry's mind; it was the slow result of a variety of causes which were not clear to the king himself. We know, however, that Anne Boleyn returned to the court of England in 1522; that she made quite a sensation there as soon as she appeared; and that among other admirers, married and unmarried, Henry soon expressed a decided preference for her. On the other hand, he seems to have been alienated from Catherine long ere the question of divorce became public; if we may trust a statement of his own, he had abstained from her bed since 1524, and his coldness for her increased with his love for Anne. That his scruples regarding his marriage awoke about the same time was certainly a very convenient coincidence.

When the demand for a divorce was first formally laid before the pope in 1528, no one anticipated that it would encounter so many difficulties. The great opponent of it was Charles V., who loyally supported his aunt, and who, as the event proved, had the pope entirely in his power. But for the emperor, Clement would soon have arranged everything to the satisfaction of the English court. As it was, he sought safety in delay. Thus he declined giving any decisive answer himself, and when he delegated the case to Wolsey and Campeggio, he managed still further to defer the question, and then to revoke it to Rome (1529). By that time Henry's patience was exhausted. As early as 1528, and as if sure of a speedy decision in their favor, the king and Anne were living familiarly together under the same roof. Their disappointment was natural, and Henry soon began to take more active measures. He appealed from the pope to the universities. Notwithstanding his life-long services Wolsey was discarded, because he was supposed not to have been sufficiently earnest about the divorce. The same year (1529) a parliament was called, which proved to be the ready auxiliary of the king in his new policy.

In 1529 the probate duties and mortuaries (or burial fees) exacted by the church were curtailed; the clergy were prohibited from following secular employments; residence was enforced, and pluralities forbidden. In 1531 the clergy were laid under the charge of *præmunire*, which they bought off by the payment of £118,000, and the acknowledgment that the king was supreme head of the church. In 1532 the abuses of "Benefit of Clergy" were reformed, annates abolished conditionally, and the independent legislative power given up by convocation. Soon after the king took a step which precipitated the crisis; he married Anne Boleyn, an event which was quickly followed by the publication in Flanders of a threat of excommunication from Rome. After this the Act of Appeals was passed, forbidding appeals from the English ecclesiastical courts to Rome, and Cranmer, in a court at Dunstable, declared the marriage with Catherine null and void. In the following year (1534) the papal authority in England was annulled, and by the Act of Supremacy Henry was declared supreme head of the English Church. The next step was a sad one; but it convinced the world that the king was in earnest. Sir Thomas More and Fisher, bishop of Winchester, the noblest champions of the old faith, two of the best and noblest Englishmen of the time, were executed for refusing to accept the Supremacy Act (1535). Such an event produced a deep sensation in Europe, but it was decisive; when the pope drew up the Bull of Deposition in 1536, which, however, was not published till 1538, the rupture with Rome was complete. In the same year (1536) the first Articles of religion, ten in number, were drawn up; in effect they were a great simplification of the old creed, though they gave little encouragement to Lutheranism. At the same time the Act for the dissolution of the smaller monasteries, which was based upon the report of a commission of inquiry, was passed, being the final important measure of the first Reformation parliament. With such events as the abolition of the papal power in England and the dissolution of the monasteries modern England begins; they inaugurate a fundamental change in the national policy and in the structure and habits of society. While the purpose, real or ostensible, of Henry had been merely to marry a younger woman and provide for the succession, he had effected the greatest revolution which England has undergone.

But he had excited the hostility of the pope and the emperor; and had seriously hurt the feelings and prejudices of a large class of his subjects. The danger of

foreign invasion was greatly increased by the discontent both in the north and west of England, where the love of use and wont in the church and in the national habits was strongest. The death of Catherine had indeed greatly relieved him, as it made reconciliation with the emperor practicable, and deprived the English opposition of a common center. The rising in Ireland was suppressed without much difficulty, but the discontent in the north which broke out in the Pilgrimage of Grace was a formidable danger (1536). It was averted more by skillful statemanship on Henry's part than by open show of force. The opposition in the west was nipped in the bud by the execution of its leaders, the marquis of Exeter and Lord Montague (1538). These measures of the king and of his minister Cromwell sometimes appeared cruel and unjustifiable, but they kept the country united; Charles was convinced of the futility of an invasion; and the thunderbolts of the pope fell harmless to the ground.

Henry had defied the emperor and the pope, and he had suppressed the conservative Catholic discontent at home with a high hand; but he was never disposed to be a Protestant. Instead of following the lead of the advanced Reformers he impressed upon the English Church his own moderate and substantially Catholic theology. At thirty he had defended the seven sacraments against Luther; he was thirty-six when he took up the question of divorce, and he was forty ere his relations to the pope had hardened into alienation and hostility. All his life he was orthodox from conviction as well as from traditional assent. Such a man could not be a revolutionary in theology.

In the meantime Henry had been less fortunate in the matrimonial scheme which had been the occasion of all the changes and dangers we have noted. A few months after the death of Catherine, Anne Boleyn was sent to the scaffold. Anne may have been guilty of the crimes laid to her charge, but Henry himself had taught her to cast aside all feminine reserve and self-respect, and his fickle heart had been captivated by another, long before the disclosures which were the ground of her death. Henry married his new love, Jane Seymour, the day after the execution of Anne (1536). The birth of Edward in the following year gratified the king's desire for a male heir; but the early death of Jane left him again without a queen. After an interval of more than two years Cromwell undertook to procure a suitable wife at the Protestant courts of Germany; but his ruin was not less complete than that of his patron Wolsey on a similar occasion, ten years before. Anne of Cleves found no favor in the king's eyes; she was divorced and pensioned off, while the enemies of Cromwell succeeded in sending him to the scaffold. Anne's place was occupied by Catherine Howard, till she, really guilty, was also executed (1542). For his sixth and last queen Henry married (1543) Catherine Parr, who proved a patient wife and an excellent nurse. During the last few years of Henry's reign, home affairs and the question of the religious revolution ceased to be the exclusive subject of interest. England and the neighboring powers were constrained to acquiesce for the time being in Henry's arrangement of things. Even the emperor cultivated his alliance. His foreign politics ended very much as they began—with a war against Scotland and France. The former arose out of certain border quarrel; the Scots were beaten at Solway Moss, but defeated an English force at Ancrum Moor. Scotland was ravaged to no purpose. The war with France (1543-46) was equally fruitless. Its chief feature was a threatened invasion by a formidable French fleet, which for some time was master of the Channel.

At home the most important point of interest was the struggle between the two factions, Protestant and Conservative, which had now for some years confronted each other—Norfolk and Bishop Gardiner of Winchester being the leaders of the latter, while the queen, Cranmer, and the earl of Hertford, uncle of young Edward, were at the head of the former. Cromwell had already fallen under the machinations of the Conservative party. Cranmer, and even the queen, were not quite safe from its attacks. The heads of that party now suffered at the close of the reign. Surrey was executed, and Norfolk was saved only by the death of the king. The effect of such measures was to make the prospects of Edward secure by confirming the power of his uncle Hertford.

Henry was anxious to arrange affairs for the accession of his son, as he felt his own life waning away. Though only in his fifty-sixth year he was unwieldy with disease and corpulence, and required to be wheeled from room to room. He died on January 28, 1547.

HENRY I., German king, was born in 876 in Saxony, of which his father, Otto, was duke. He distinguished himself in early youth by the courage and energy with which he warred against the Slavonic tribes to the east of his native duchy. Otto, who died in 912, appointed Henry his successor, not only as duke of Saxony but as lord of Thuringia and part of Franconia. Conrad I. resisted the claims of the young duke; but he was ultimately left in possession of all the lands his father had ruled. After Conrad's death Henry was chosen king by the Franconian and Saxon nobles, and he had not much difficulty in securing the acquiescence of the rest of Germany. In 933 the Hungarians demanded as usual the tribute which had till then been punctually paid, and when it was refused invaded Thuringia with a great army. Henry twice defeated them, and they were so overwhelmed by this misfortune that they did not enter Germany for some years, and were never again seen in the northern duchies. Having thus broken the power of all the chief enemies of his country, Henry took precautions for the future by establishing the marches of Schleswig, of Meissen and perhaps of Brandenburg. Toward the close of his life his position was so secure that he resolved to go to Rome and claim the imperial crown. In the midst of his preparations he died in 936 at Memleben, and was buried in St. Peter's church at Quedlinburg.

HENRY II., Holy Roman emperor, was born in 972. He was the son of Henry the Wrangler, duke of Bavaria, a grandson of King Henry I. In 995 he succeeded to the duchy of Bavaria, and six years afterward went to Rome with the young emperor Otto III., to whom he rendered important services. When Otto III. died, Henry, as the chief surviving representative of the house of Saxony, took possession of the insignia of the empire, and was crowned German king at Mainz on June 7, 1002. His most determined enemy during the greater part of his reign was Boleslaus II. of Poland. This ambitious and strong-willed prince annexed Bohemia, and during the king's absence in Italy broke into Lusatia and Meissen. Henry hurried back, defeated Boleslaus in 1005, and granted Bohemia in fief to Jaromir, son of the previous duke. Boleslaus, however, continued the war, which was not ended till 1018, when Henry was obliged to conclude peace. In 1014 Henry was crowned emperor at Rome by Benedict VIII., whom he had confirmed in the papal see in opposition to the antipope Gregory. At the request of Benedict the emperor returned to Italy in 1022 in order to drive back the Greeks, who were steadily pressing northward. In this enterprise he associated himself with the Normans, who thus became one of the

most important factors in the political life of Italy. Henry's health, which was always feeble, rapidly declined after this third visit to his southern dominions, and in 1024 he died.

HENRY III., Holy Roman emperor, was the son of Conrad II., the founder of the Franconian dynasty. He was born in 1017, and was elected German king in 1026, became in 1027 duke of Bavaria, and in 1038 duke of Swabia and king of Burgundy. He became the reigning sovereign of Germany in 1039, at the age of twenty-two. Of an upright and resolute temper, he soon made his power felt both in church and state. Henry was as distinguished in his wars as in his home government. He began in 1042 a series of campaigns in Hungary, where for the first time he asserted the supremacy of Germany. In Italy he was equally successful, not only maintaining his right to the Lombard crown, but establishing supremacy over the Normans in Apulia and Calabria. At a council of prelates in Sutri in 1046, he caused the rival popes, Benedict IX., Sylvester II. and Gregory VI., to be deposed, and raised to the papal see, as Clement II., Suitger, bishop of Bamberg. Three other German bishops, one after the other, were appointed to the same position; and as all of them were devout men and energetic administrators, they did much to purify the ecclesiastical system of Europe. Henry died in 1056 at Botfeld.

HENRY IV., Holy Roman emperor, son of Henry III., was born in 1050, and crowned German king at the age of four during his father's lifetime. After the death of Henry III. in 1056, the government was undertaken by the empress Agnes, the young king's mother. Henry III.'s vigorous rule, while it had secured the prosperity of the nation as a whole, had excited bitter discontent among the great nobles, and immediately after his death they began to make attempts to recover some portion of the independence he had taken from them. In 1062, Anno, archbishop of Cologne, succeeded in gaining possession of the king by enticing him on board a boat on the Rhine. Agnes then resigned her position, and Anno ruled in her stead. He was a harsh, bigoted, and despotic prelate, and excited Henry's bitter hatred by the sternness of his discipline. In his fifteenth year Henry was declared, in accordance with the Riparian Code, to have reached his majority, but the royal authority was really exercised by Adalbert, archbishop of Bremen, who aroused the jealousy of the princes both by his splendid style of living and by his opposition to their usurped powers. At a diet held in Tribur he was compelled to yield the first place once more to Anno. Anno caused Henry to marry Bertha, the daughter of the margrave of Susa, to whom he had for some time been betrothed. At first he regarded her with strong dislike; but after she had borne him a son in 1071 she succeeded in gaining his affections, and was afterward his most trusted friend and companion.

Henry's reign was one of the most troubled in German history. His chief anxieties began in consequence of Otto of Nordheim, duke of Bavaria, being charged with an intention of murdering him. Otto was declared to have forfeited his titles, and his lands were seized and overrun. Supported by Duke Magnus of Saxony he rebelled, but both princes were quickly subdued. A new rebellion was organized by Otto of Nordheim, who suddenly, at the head of 60,000 men, appeared before the Harzburg, a strong Saxon fortress in which Henry resided. He escaped, but he was looked upon so coldly by the princes that he found it expedient to yield nearly all the demands of his enemies. An opportunity of revenge was, however, created for him by the violence of a body of peasants, who destroyed a chapel connected

with the Harzburg and violated the graves of the king's brother and infant son. He had then no difficulty in obtaining an imperial army, and after defeating the rebels at Hohenburg in 1075, he imposed on them his own terms, and seemed to be on the point of asserting the ascendancy which had been exercised by Henry III.

Meanwhile Hildebrand had become pope as Gregory VII., and had already indicated his design of making the papacy supreme over all earthly authorities. Henry appealed to him to degrade those prelates who had associated themselves with the rebels. Instead of responding favorably to the appeal, Gregory called upon the king to answer to certain charges preferred against him by his subjects. Failing to realize how much power the papacy had acquired through the reforms effected by his father, Henry summoned a council of German prelates at Worms in 1076, and declared the pope deposed. The reply was a sentence of excommunication. Henry's adherents so rapidly fell away that a reconciliation with the pope was soon perceived to be absolutely necessary. Escaping from his enemies he crossed the Alps in the depth of winter, accompanied only by his wife and child and by a few faithful attendants. The nobles of Lombardy were not unwilling to take up his cause, but he preferred to hurry forward to the castle of Canossa, where Gregory was residing with his friend the Countess Matilda. There occurred the famous scene in which Henry, the highest of secular potentates, stood for three days in the courtyard of the castle, clad in the shirt of a penitent, and entreating to be admitted to the pope's presence.

The ban was removed; nevertheless the German princes elected Duke Rudolf of Swabia as their king, and they were soon openly supported by the pope, who resented Henry's persistent opposition to his great scheme for the deliverance of the clergy from the system of feudal investiture. Henry renewed his sentence of deposition against Gregory, and raised Guibert, archbishop of Ravenna, to the papacy as Clement III. After the death of the anti-king Rudolf in 1080 he went to uphold his rights in Italy, and in 1084 he gained possession of Rome, where Clement III. crowned him emperor. In Germany Count Hermann of Luxembourg had been chosen as successor to Rudolf, and in 1085 he defeated Henry near Würzburg; but in 1087 he voluntarily resigned his position, and soon afterward died. A third anti-king, Margrave Eckbert of Meissen, also died in 1089; and had Henry had no enemies outside his native kingdom there would then have been peace. But Victor III. and Urban II., the successors of Gregory VII. (who died in 1085), continued to oppose him, and in 1090 he was obliged to proceed to Italy for the third time to support Clement III., his own anti-pope. While engaged in this struggle he learned that his son Conrad had been induced by the papal party to rebel against him. Stunned by this unexpected blow, the emperor withdrew in disgust to a remote fortress, where he remained inactive for several years. In 1096 he recovered his energy, returned to Germany, and by timely concessions managed to overcome the opposition of his leading enemies. A diet at Mainz decided that Conrad had forfeited his right to the throne, and his brother Henry was proclaimed the emperor's successor. Pope Urban II., the anti-pope Clement III., and Conrad, all died within two years, and Henry had reason to hope that he would be able to end his life in quiet. But Paschal II., pursuing the policy of his predecessors, once more excommunicated the emperor, who was driven to despair by the fact of his son Henry putting himself at the head of the pope's supporters. The aged monarch, deceived by false promises, fell into his hands, and was detained as a

prisoner. He ultimately fled to Liège, where he might still have been able to bring an army together; but in 1106 he was relieved from his heavy cares by death.

HENRY V., Holy Roman emperor, son of Henry IV., was born in 1081. In 1098, his elder brother Conrad having forfeited his right to the throne by rebellion, he was appointed his father's successor. Six years afterward he himself rebelled against the emperor, toward whom he played the part of a thorough traitor. The papal party, with which he allied himself, took for granted that when he mounted the throne church and state would be instantly reconciled; but their hopes were disappointed. The main point for which Henry IV. had contended was the right of investing the bishops with ring and staff. When Henry V. succeeded him in 1105, Pope Pascal II. demanded that this right should be given up, but he replied that he could not resign powers which had been exercised by his predecessors, and the loss of which would imply that the ecclesiastical lands of Germany would be removed from secular control. In 1110 he entered Italy at the head of 30,000 men. Alarmed at this display of force, Pascal withdrew his claims, and a day was appointed for the coronation of Henry as emperor. The opposition of the Roman prelates made it impossible for the pope to proceed with the ceremony, whereupon he and his cardinals were made prisoners. Pascal then formally recognized the right of investiture, and Henry received the imperial crown. When the Germans had recrossed the Alps Pascal renounced the treaty he had concluded, and the emperor was excommunicated. Germany again became the scene of confused contests like those which had brought misery upon it during Henry IV.'s long reign. In 1116 the emperor went a second time to Italy and drove Pascal from Rome; and after Pascal's death he caused Gregory VIII. to be appointed pope. The extreme papal party, however, selected Gelasius II., who renewed the sentence of excommunication against Henry. The latter returned to Germany in 1119, and at a diet in Tribur succeeded in allaying the hostility of the more important among his enemies. Pope Calixtus II., who succeeded Gelasius in 1119, now found it necessary to offer a compromise; and the controversy between the empire and the papacy was for the time closed by the concordat of Worms, which was concluded in 1122. By this treaty it was agreed that at every election of a prelate the emperor should have the right of being present, either in person or through a representative, and that the chosen bishop, before being consecrated, should receive his lands and secular authority in fief of the crown. Notwithstanding this settlement Germany did not long enjoy peace, for a number of petty wars broke out which Henry was not strong enough to quell. He died at Nimeguen in 1125, and with him was extinguished the Franconian dynasty.

HENRY VI., Holy Roman emperor, the son of Frederick I., was born in 1105, and received the German crown in 1169. When his father started for Palestine at the head of the third crusade, Henry was made imperial vicar, and he succeeded to the throne after the news of his father's sudden death reached Germany, in 1190. Henry the Lion, who had been banished to England by Frederick I., returned to Germany after the departure of the latter for the Holy Land. Henry resisted him, but on becoming the reigning sovereign he concluded peace, and hastened to Rome, where he was crowned emperor in 1191. Through his wife, Constantia, he had a right to the throne of Sicily; but the Sicilian nobles had made Count Tancred, an illegitimate son of Constantia's brother, king. After receiving the imperial crown Henry advanced against Tancred, and the whole of southern Italy, except Naples, was quickly

in his possession. Before Naples his army was struck by pestilence, and he was forced to return to Germany. There he suppressed various private wars, and compelled Henry the Lion to acknowledge his supremacy. The great ransom which he received from Richard I. of England enabled him to fit out a fine army, and with this he descended upon Italy in 1194, and without much difficulty conquered the Sicilian kingdom. On his return to Germany it was easy for him, with the prestige he had now acquired, to enforce submission; and so great was his authority that, in 1196, he made attempts to secure that the crown should be declared hereditary in his family. He might have succeeded had he lived some years longer; but in 1197 he died at Messina.

HENRY VII., Holy Roman emperor, was born in 1282. He was the son of Henry II., count of Luxembourg, and was elected king in 1308, seven months after the murder of Albert I. He owed his election partly to the fact that he was comparatively unimportant, which led the electors to suppose that under him the powers of the princes would be exposed to no great danger. When he came to the throne Bohemia was subject to Henry of Carinthia, whom the people extremely disliked. The king at once displaced him, and enriched his own family by granting Bohemia, at the request of the Bohemians themselves, to his son John, whose claims were rendered secure by his marriage with Elizabeth, the daughter of Wenceslaus II. For some time no German king had sought the imperial crown; but Henry, who was of an imaginative temperament, could not forget the splendid dignities to which the wearer of the crown of Germany was entitled. Unfortunately, the easiest way in which Henry could obtain immediate power for his plans in Italy was to ally himself with the princes against the cities; and this was in most instances the course which he adopted. His visit to Italy was looked forward to with eagerness by the Ghibellines, whose hopes were expressed in words of glowing eloquence by Dante. He held aloof at first from both the great parties in the state, and was in consequence liked by neither. In 1312 he was crowned emperor in Rome, having previously received the iron crown in Milan. But while he was in Rome, Robert of Naples was there also, with a strong army, and in order to obtain adequate support, it was necessary for Henry to declare himself on the side of the Ghibellines. He then resolved to conquer Naples, but while advancing on this expedition, he died at Buonconvento, on August 24, 1313.

HENRY I. (1005-1060), king of France, son of King Robert and Constance of Aquitaine, and grandson of Hugh Capet, came to the throne in 1031. On his accession his mother, who favored her youngest son Robert, allied herself with the chief feudal nobles, and drove Henry to take refuge at the court of Duke Robert II. of Normandy. With the duke's help he soon broke up her league. Constance died in 1032, and Henry, by granting him the duchy of Burgundy, secured the goodwill of Robert's brother, who thus became head of the first house of Burgundy. After the death of Robert "the Devil," Henry, who had first supported William the Bastard, in 1053 and 1054, tried to weaken the power of the Normans. Leaguely himself with the count of Anjou, and calling his brother Eudes into the field, he invaded Normandy from Evreux. When, however, Eudes had been defeated at Mortemer, Henry drew back in haste, and left the Normans to themselves. In 1059 he had his eldest son Philip crowned as joint-king, and died in 1060.

HENRY II., king of France, the second son of Francis I. and Claude, was born in 1519, and succeeded to the throne in 1547. When only seven years old he

was sent by his father, with his brother the dauphin Francis, as a hostage to Spain in 1526, whence they returned after the conclusion of the peace of Cambray in 1529. In 1533 his father married him to Catherine de' Medici. Italian manners and politics entered with her into France, and long affected the history and fortunes of the country. Henry gathered round him a court which contrasted strongly with that of his father. Francis, with all his grave faults and selfishness, had fostered learning, had treated his people kindly, and had rarely checked even the Reformers. But Henry, under the influence of Diana of Poitiers, headed the strict Catholic movement; the escape of the learned from Paris to Geneva at his accession showed that not merely Huguenot doctrines but Renaissance studies were in peril. Immorality did not take flight, for Diana of Poitiers and Catherine de' Medici were at court, but it ceased to be gay and bright; men must be grave and severe, even in their vices. At first Diana of Poitiers and the grim old soldier Anne of Montmorency swayed the king; later, the two brothers Francis, duke of Guise, and Charles, cardinal of Lorraine, rose to power, with the marshal St. André; everything was done and given through one or other of these men. Catherine de' Medici was as yet completely in the background.

The final union of Brittany with France marks the opening year of the reign. In 1548 Henry won a great diplomatic triumph over the ministers of Edward VI. of England, by getting possession of Mary, queen of Scots, then only six years old; he had her educated in France, and eventually married to his son the dauphin Francis. In 1549 he appeared in Paris for the first time, and marked his presence by a great burning of Calvinists; and soon after he claimed back Boulogne, which had been promised to Francis I. by Henry VIII. After a successful campaign, he made the English Government, then extremely weak, cede Boulogne, and Henry entered the place in May, 1550.

Hitherto he had not come into collision with Charles V.; the time was now approaching when he would enter into contest with him, and permanently advance the borders of his kingdom, while he inflicted a great blow on the emperor. Though early in his reign he had dealt with the German Protestants, and with the Ottoman power, he had taken no active steps; now the league of German princes, headed by Maurice of Saxony, offered an opportunity not to be missed. Henry made a compact with the Swiss and Turks, and concluded a secret treaty (September 3, 1550) with the German princes; in 1552, by the league of Chambord, he undertook to seize the three bishoprics, — Metz, Verdun, and Toul. And so while Maurice drove the emperor from Innsbruck, Henry sent Montmorency into Lorraine. The bishoprics were won almost without a blow, and Henry was acknowledged as "avenger of Germanic liberty"; an attempt on Strasburg failed. After the siege of Metz by Charles V. in the winter of 1552-53, this district, French-speaking, though feudally under the empire, remained in French hands, — Metz till 1870, Toul and Verdun to this day.

In 1556 Henry, supporting the anti-Spanish policy of the "Theatine" pope, Paul IV., again made war with Spain. Francis of Guise was sent early in 1557 into Italy to oppose the duke of Alva. Anne of Montmorency went to the northern frontier; Gaspard of Coligny, who commanded in Picardy, was ordered to begin hostilities. These led to the disastrous battle of St. Quentin, in which the French were utterly defeated (August 10, 1557); it was followed by the fall of the town, at that time the chief bulwark of France to the north. Francis of Guise, recalled in haste from Italy,

redressed the balance at the expense of England by the capture of Calais (January, 1558), and the triumph of the house of Guise seemed complete when Mary Stuart was married to the dauphin in the same year; their niece, with her claims on the Scottish and English crowns, would now ascend the throne of France. The defeat of the French at Gravelines, the desire of Montmorency to escape from captivity, the wish of the High Catholics to have leisure to extirpate heresy, the sympathy of Philip with that aim, the accession of Elizabeth of England, all these things made peace necessary, and the treaty of Cateau Cambresis (April, 1559) closed the war. As a sequel to the peace high feast was held at Paris to celebrate the marriage of Henry's two daughters; in a tournament he received his death-wound from the captain of his Scottish guards, Montgomery. So ended Henry II., in his forty-first year. By Catherine de' Medici he had ten children, three of whom succeeded to the throne, — Francis II., Charles IX., and Henry III.

HENRY III., king of France, third son of Henry II. and Catherine de' Medici, was born in 1551 and succeeded to the throne of France in 1574. In his youth, as duke of Anjou, he was warmly attached to the Huguenot opinions, as we learn from his sister Margaret of Navarre; but his unstable character soon gave way before his mother's will, and both Henry and Margaret remained as choice ornaments of the Catholic church. Henry won two brilliant victories at Jarnac and Moncontour (1569), and thereby attracted the eyes of the Polish nobles, who elected him their king in 1573. He went to Warsaw, but, on the death of his brother Charles IX. in 1574, came back to France and assumed the crown. He returned to a wretched kingdom, torn with civil war. Now began that "reign of favorites" which has made his career a byword. His mother, ever balancing between parties, first favored the favorites, then went with the Huguenot chiefs. In these days the famous League was organized (see FRANCE), and Henry declared himself its head in 1576. He took but a feeble part in the sixth and seventh civil wars, and was little in earnest till, in 1584, the death of his younger brother, Francis, duke of Anjou, made Henry of Navarre next heir to the throne, and excited to the utmost the fierce passions of the Guises and the League. The Parisian development of the League under the "sixteen" (1585), with its devotion to Henry, duke of Guise, and its determination to exclude the heretic of Navarre, to depose the wavering Henry III., and to make Cardinal Bourbon king — this, as well as the menacing attitude of Philip II. of Spain, forced Henry III. to draw toward his distant cousin Henry of Navarre. He was driven to desperation by the commanding position assumed by the house of Guise; and in 1588 Henry of Guise and his brother the cardinal were assassinated by his orders. Henry III. now found himself powerless; early in 1589 he again joined Henry of Navarre, and with him laid siege to Paris. There he was murdered by one Jacques Clement, a priest. With Henry III. ended the direct line of the house of Valois.

HENRY IV., king of France, was born in the castle of Pau in 1553, being son of Antony of Bourbon, king of Navarre and duke of Vendôme, and Jeanne of Albret. By his father he was tenth in descent from Saint Louis, and only a very distant cousin to his predecessor, Henry III. His mother, a grand and noble lady, brought him up as a Calvinist. His education was rough and hard, and fostered that originality of character which so marked his life; his military training was under the great captain, Gaspard of Coligny. In 1571 he was wedded to the daughter of Catherine de' Medici, Mar-

garet of Valois; and on his mother's death in 1572 he became king of Navarre. The massacre of St. Bartholomew found him in Paris; but his life was spared on his making a profession of Catholicism, which lasted till he succeeded in escaping from court in 1575. Thenceforward he became the acknowledged head of the Huguenots, and by his dashing bravery kept life in their dispirited forces. No man was better fitted for such work; he had all the qualities of a guerrilla leader, though he was not a great general. His success at Contras (1587) and the joyousness and generosity of his character endeared him to his followers, while it secured the respect even of his opponents. After the death of Henry III. he was recognized as king of France by only a portion of the army then besieging Paris (August 4, 1589); the Catholic "Politiques" in the army stood aloof and disbanded; the Huguenots formed the only sound nucleus of his power. At Arques (1589) and Ivry (1590) he brilliantly defeated the Leaguers, and resumed the siege of Paris; Alexander of Parma, however, prevented him from taking Rouen (1592); much less could he take Paris. Finding affairs hard, and desiring to be a king and not a guerrilla-captain, in 1593 Henry professed Catholicism. By this step he struck a deadly blow at the League and made powerless the intrigues of Philip II. For between the fanatical Catholics on one side and the Huguenots on the other lay the great bulk of Frenchmen; the "Politique" party had become more and more powerful, until at length it was felt to be the true national party. The only thing which kept it from Henry was the difference of faith; that barrier removed, all France at once joyfully accepted him as king. The Leaguers became almost a foreign body; the Huguenots gloomily accepted his triumph, bought, as they held, at cost of principle. After the battle of Fontaine-Francaise in 1595 the Spanish and Leaguers were driven out of Burgundy, and the recovery of Amiens from the Spaniards in 1596 secured Picardy and the northern frontier.

After 1598 the energies of Henry IV. were given to the restoration of his country, which, in nearly forty years of civil war, had suffered terribly; the organizing genius of Maximilian of Bethune, duke of Sully, restored the finances; agriculture, manufactures and commerce made marvelous advances. Henry also upheld the authority of France; in 1601 he acquired Bresse, Bugey and Valromey from Savoy. He supported the Netherlands against Spain, and he was preparing a great army, which, in combination with the Dutch under Maurice of Nassau, was to interfere in the tangled Cleves-Juliers question, when he was assassinated by Ravaillac on May 14, 1610.

Henry IV. left no children by his first wife, Margaret of Valois; by his second, Marie de' Medici, he had three sons and three daughters—Louis, who succeeded him as Louis XIII.; a child, who died in 1611; Gaston, duke of Orleans, the meanest of the race; Elizabeth, wife of Philip IV., king of Spain; Christine, wife of Victor Amadeus, duke of Savoy; and lastly Henriette Marie, queen of England, spouse of Charles I. He also left behind him several natural children, of whom the most celebrated was César, duke of Vendôme, son of the famous Gabrielle d'Estrées.

HENRY I., king of Portugal, born at Lisbon, January 31, 1512, was the third son of Emanuel the Fortunate, was destined for the church, and in 1532 was raised to the archiepiscopal see of Braga. In 1542 he received the cardinal's hat, and in 1578, when he was called to succeed his grandnephew Sebastian on the throne, he held the archbishoprics of Lisbon and Coimbra as well as that of Braga, in addition to the wealthy abbacy of Alcobazar. As an ecclesiastic he was pious, pure, simple in his mode of life, charitable,

and a learned and liberal patron of letters; but as a sovereign he proved weak, timid, and incapable. On his death in 1580 after a brief reign of seventeen months the male line of the royal family which traced its descent from Henry, first count of Portugal (c. 1100), came to an end; and all attempts to fix the succession during his lifetime having ignominiously failed, Portugal became an easy prey to Philip II. of Spain.

HENRY I., king of Castile, son of King Alphonso "the Noble," by Eleanor, daughter of Henry II. of England; succeeded his father in 1214, and was killed by the falling of a tile in 1217, after a reign of only two years and nine months. He was succeeded by Ferdinand III., son of his sister Berenguela.

HENRY II., king of Castile, surnamed *el Bastardo* or *de la Merced*, was one of the six illegitimate sons of King Alphonso "the Avenger," and consequently half-brother to Pedro the Cruel, who legally succeeded to the throne of Castile in 1350. His mother was Leonora de Guzman. The extraordinary series of cold-blooded murders which earned for Pedro his unenviable surname encouraged Henry, then known as count of Trastamara, to lead repeated rebellions, in which, with the aid of the French under Du Guesclin, and in spite of the opposition of the English under the Black Prince, he was ultimately successful in 1369. He immediately proceeded to direct his arms against the most formidable of his numerous enemies, King Ferdinand of Portugal, and by four campaigns, during the last of which he forced his way to the very gates of Lisbon (March, 1373), succeeded in establishing a favorable peace. At the same time he entered into a treaty with the king of Navarre, which subsisted, however, for only three years; in 1375 friendly relations with the king of Aragon were formed, which were cemented by the marriage of the daughter of the latter to Don Juan of Castile. The reign of Henry II., which was devoted rather to defensive than to aggressive warfare, was not marked by any of the usual exploits against the Moors, but it is distinguished in the annals of Castile by some noteworthy improvements in legislation and reforms in the administration of justice, sanctioned in the cortes of Toro in 1369 and 1372; and Spanish historians also mention with special pride the defeat of the English by the Spanish fleet at Rochelle in 1372. Henry died of poison, it is supposed, on May 30, 1379, and was succeeded by his son John (Juan) I.

HENRY III., king of Castile, surnamed *el Doliente* (the sickly), was born in 1379, and succeeded his father John I. in 1390. During his minority, the kingdom was in a constant state of disturbance, bordering upon civil war; Henry at last resolved to take the reins of government entirely into his own hands (1393). He succeeded within two years in quelling the turbulence of his nobles, in establishing his own popularity with the body of the people, and thus in effecting the pacification of his kingdom. The only foreign war during this reign was that with Portugal, which terminated in the peace of 1399; a great expedition against the kingdom of Granada, for which extensive preparations had been made, and for which large grants from the cortes held in Toledo in 1406 had been obtained, was brought to an abrupt termination by the death of Henry at that city on December 25th of the same year. Henry III. was succeeded by John II., his eldest son by Catherine of Lancaster, whom he had married in 1393.

HENRY IV., king of Castile, surnamed *el Impotente* (the impotent), and sometimes *el Liberal* (the spendthrift), the eldest son of John II. by his first wife, Mary of Aragon, was born at Valladolid on January 6, 1425. As prince of Asturias, he took a prominent and generally an unsflattering part, in most of the disturbances of his

father's reign; in 1445 a pitched battle between the king and the prince was prevented only at the last moment by the intervention of the clergy and some of the nobles, and peace was not finally secured until 1450, when Pope Nicholas V. issued his bull of excommunication against all those in the peninsula who, by perplexing the affairs of the sovereign, were disastrously helping the cause of the infidels. In 1440 Henry had, in accordance with a treaty signed in 1436, been united to Blanche of Aragon; but this marriage, which had not been happy, and which had given cause for many scandalous reports, he dissolved in 1453, shortly before his accession to the throne on his father's death in July of that year. He began his reign with a great show of energy against the Moors; but the boldness of his intentions contrasted strangely with the feebleness of his execution. In 1465 occurred at Avila the extraordinary scene, so often described, of the king's deposition in favor of his brother Alphonso; this was followed in 1468, shortly after Alphonso's death, by the election of his sister Isabella, who, however, declined to accept the proffered crown. In the same year Henry was forced to repudiate his wife Joanna of Portugal, and to disinherit her daughter Juana (la Beltraneja) whom he had unsuccessfully attempted to put forward as also his; and thus the succession became fixed in favor of Isabella, who was married to Ferdinand of Aragon in the following year. Henry died at Madrid on December 12, 1474.

HENRY I., of Navarre, surnamed *le Gros*, third count of Champagne, was the youngest son of Theobald I. of Navarre, by Margaret of Foix, and succeeded his eldest brother Theobald II. in December, 1270. His proclamation at Pamplona, however, did not occur till March of the following year, and his coronation was delayed until May, 1273. After a brief reign, characterized it is said by dignity and talent, he died in July, 1274, suffocated, according to the generally received accounts, with his own fat. In him the male line of the counts of Champagne, kings of Navarre, became extinct.

HENRY II., or Henri d'Albret, titular king of Navarre, born at Sanguessa in April, 1503, was the eldest son of Jean d'Albret by Catherine of Navarre; and on the death of the latter in exile in June, 1516, succeeded his parents in all their claims against Ferdinand the Catholic, assuming under the protection of Francis I. of France the title of king of Navarre. After the ineffectual conferences at Noyon (1516) and at Montpelier 1518, an active effort was made in 1521 to establish him in the *de facto* sovereignty; but the French troops which, under André de l'Esparre, had seized the country, were ultimately expelled by the Spanish viceroy, the duke of Najera. Henry, who along with Francis was taken prisoner at the battle of Pavia (1525) but afterward contrived to escape, married Margaret, the only sister of the latter, in 1526, and by her became the father of Jeanne d'Albret, the mother of Henry IV. of France. He died at Pau on May 25, 1555.

HENRY III. of Navarre. See HENRY IV. of France.

HENRY, PRINCE (1394-1460), of Portugal, surnamed "the navigator," to whose enlightened foresight and perseverance the human race is indebted for the maritime discovery, within one century, of more than half the globe, was born at Oporto, on March 4, 1394. His father was João I., under whose reign Portugal first began to recover from her subjugation by the Moors, and to assume a prominent position among the nations of Europe; his mother was Philippa, daughter of John of Gaunt. Prince Henry and his elder brothers, Duarte and Pedro, were sent out in 1415 on an expedition against the important Moorish city of Ceuta,

which, after much hard fighting they succeeded in taking. All the princes distinguished themselves at the siege, but Prince Henry so pre-eminently that, but for his own entreaties, his father would have knighted him in precedence of his brothers. His renown after this became so high that he was invited severally by the pope, the emperor, and the kings of Castile (Juan II.) and England (Henry V.) to take command of their respective armies. The prince, however, had set his mind on other and larger plans, involving no less than the hope of reaching India by the south point of Africa. To this end he had several encouragements; the geographical position of Portugal was in his favor; the large revenues of the order of Christ, of which he was grand-master, provided him with means; and he had contrived to gather important information from the Moors with regard to the coast of Guinea and the populous nations of the interior of Africa. Accordingly in 1418-19 he took up his abode on the extreme southwestern point of Europe, the promontory of Sagres, in Algarve, of which kingdom he was made governor in perpetuity, with the purpose of devoting himself to the study of astronomy and mathematics, and to the direction and encouragement of the expeditions which he proposed to send forth. There he erected an observatory, the first set up in Portugal, and at great expense procured the services of one Mestre Jacome from Majorca, a man very skillful in the art of navigation and in the making of maps and instruments, to instruct the Portuguese officers in those sciences. An account has already been given of his principal explorations in the article GEOGRAPHY. At first his efforts seemed to be crowned with little success, and his various expeditions called down upon him much obloquy from the nobles, who complained of such an amount of useless expenditure; but on the prince vituperation fell harmless. The king died in 1433, and the troubles which followed occupied Prince Henry until 1440. In the following year Cape Branco was reached, and in 1443 intercourse was established with negro states in Senegal and Gambia. In 1444-5 were discovered the river Senegal, Cape Verd, Cape St. Anne, Cabo dos Mastos, and the Rio Grande. During the later years of his life Gomez and others made important voyages of discovery in Prince Henry's service. He died November 13, 1460, in his town on Cape St. Vincent, and was buried in the church of St. Mary in Lagos, but a year later his body was removed to the superb convent of Batalha.

HENRY THE LION, duke of Saxony and Bavaria, son of Henry the Proud, was born in 1129. After the death in 1139 of his father, who had been deprived of his possessions by Conrad III., the bravery and energy of his mother, Gertrude, and his grandmother, Richenza, secured to him the duchy of Saxony. Shortly after coming of age he at the diet of Frankfort, in 1147, demanded also the restoration of Bavaria, but was refused, upon which, along with his uncle Welf VI., he made an unsuccessful attempt to seize it by force of arms. In 1154 he, however, received from Frederick I. the formal recognition of his claims to its possession, and in 1156 Henry Jasomirgott was compelled to deliver it up to him. Besides distinguishing himself in the wars of Frederick in Italy, Henry now devoted his energies to establishing his power in his own dominions, both by conquest and by encouraging agriculture and trade. He extended the boundaries of Saxony beyond the Elbe by successful battles against the Slavs, founded Munich in Bavaria, colonized Mecklenburg and Holstein, and fostered the growth of Hamburg and Lübeck. In February, 1168, Henry, having previously divorced Clementia of Zähringen, married Matilda, daughter of Henry II. of England; and, shortly after his return

from a pilgrimage to the Holy Land in 1172, began to treat the emperor with coldness and to revive the traditional rivalry of his race with the Hohenstaufens. He took no part in the Italian expedition of 1174, and in 1176 his sudden desertion of Frederick in the crisis of his struggles with the Lombard cities resulted in the disaster at Legnano. On Frederick's return from Italy in 1177 Henry was summoned to appear before him at the diet of Worms, and declining to do so he was placed under the ban of the empire, and his lands divided among other princes. For more than a year he endeavored to resist the execution of the imperial decree, but he found it necessary at last, in November, 1181, to give in his submission to Frederick, who, on condition that he remained three years in England, agreed to reinstate him in the possession of Brunswick and Lüneburg. Having in 1189 refused to accompany Frederick on his crusade, he was again compelled to withdraw to England, but shortly after Frederick's departure he returned, and, concluding an alliance with the archbishop of Bremen, made a second attempt to recover his territories; but, though at first he gained several important victories, he was ultimately compelled, in July, 1190, to conclude a peace at Fulda, which secured to him scarcely any advantages from the contest. Emboldened by the hostile alliance formed against the emperor Henry VI., in 1192, he again renewed the struggle; but after Richard of England fell into the hands of the emperor in the following year, he found it necessary again to give in his submission; and shortly afterward a pledge of amity between the two houses was given through the marriage of the eldest son of Henry the Lion to Agnes, niece of Frederick I., and cousin of the reigning emperor. Henry died August 6, 1195, at Brunswick, and was buried in the church of St. Blaise.

HENRY THE DEACON—variously called of Cluny, because he was at one time a monk of that rule, of Lausanne, because he is believed to have first appeared as a preacher of repentance there, and of Toulouse, because his later years were passed in that city and neighborhood—founder of the anti-sacerdotal sect of *Henricians*, was of Swiss or Italian extraction (his birthplace is unknown), and was born toward the end of the eleventh century.

HENRY OF GHENT. The scholastic writer generally known by this name was born probably about 1217 in the district of Mude, near Ghent.

HENRY OF HUNTINGDON, an English chronicler of the twelfth century, born, it is likely, between 1080 and 1090.

HENRY, JOSEPH, an eminent American physicist, was born in Albany, N. Y., December 17, 1797. He received his education at an ordinary school, and afterward at the Albany academy. On finishing his academic studies he contemplated adopting the medical profession, and prosecuted his studies in chemistry, anatomy and physiology with that view. He occasionally contributed papers to the Albany institute, in the years 1824 and 1825, on chemical and mechanical subjects; and in the latter year was appointed assistant engineer on the survey of a route for a State road from the Hudson river to Lake Erie. This diversion from his original bent gave an inclination to the career of civil and mechanical engineering; and in the spring of 1826 he was elected by the trustees of the Albany academy to the chair of mathematics and natural philosophy in that institution. In the latter part of 1827 he read before the Albany institute his first important contribution, "On some Modifications of the Electro-Magnetic Apparatus." In June, 1828, and in March, 1829, he exhibited before the institute small electro-magnets closely and repeatedly wound with silk-covered wire, which had

a far greater lifting power than any then known. Henry appears to have been the first to adopt insulated or silk-covered wire for the magnetic coil; and also the first to employ what may be called the "spool" winding for the limbs of the magnet. He was also the first to demonstrate experimentally the difference of action between what he called a "quantity" magnet excited by a "quantity" battery of a single pair, and an "intensity" magnet with long fine wire coil excited by an "intensity" battery of many elements, having their resistances suitably proportioned. He pointed out that the latter form alone was applicable to telegraphic purposes. Henry's "quantity" magnets acquired considerable celebrity at the time, from their unprecedented attractive power—one lifting 750 pounds, another 2,300, and a third 3,500.

In 1831 he arranged a small office-bell to be tapped by the polarized armature of an "intensity" magnet, whose coil was in continuation of a mile of insulated copper wire, suspended about one of the rooms of his academy. This was the first instance of magnetizing iron at a distance, or of a suitable combination of magnet and battery being so arranged as to be capable of such action. It was, therefore, the earliest example of a true "magnetic" telegraph, all preceding experiments to this end having been on the galvanometer or needle principle. About the same time he devised and constructed the first electro-magnetic engine with automatic pole-changer. In 1832 he discovered the induction of a current on itself, in a long helical wire, giving greatly increased intensity of discharge (Silliman's *Am. Jour. Sci.*, July, 1832, xxii. 408). In 1832 he was elected to the chair of natural philosophy in the New Jersey college at Princeton. In 1834 he continued and extended his researches "On the Influence of a Spiral Conductor in increasing the Intensity of Electricity from a Galvanic Arrangement of a Single Pair." In 1835 he combined the short circuit of his monster magnet (of 1834) with the small "intensity" magnet of an experimental telegraph wire, thereby establishing the fact that very powerful mechanical effects could be produced at a great distance by the agency of a very feeble magnet used as a circuit maker and breaker, or as a "trigger"—the precursor of later forms of relay and receiving magnets. In 1838 he made important investigations in regard to the conditions and range of induction from electrical currents—showing that induced currents, although merely momentary, produce still other or tertiary currents, and thus on through successive orders of induction, with alternating signs, and with reversed initial and terminal signs. He also discovered similar successive orders of induction in the case of the passage of frictional electricity. Among many minor observations, he discovered in 1842 the oscillatory nature of the electrical discharge, magnetizing about a thousand needles in the course of his experiments.

In December, 1846, Henry was elected secretary and director of the Smithsonian Institution, then just established. While closely occupied with the exacting duties of that office, he still found time to prosecute many original inquiries—as into the application of acoustics to public buildings, and the best construction and arrangement of lecture-rooms, into the strength of various building materials, etc. Having early devoted much attention to meteorology, both in observing and in reducing and discussing observations, he (among his first administrative acts) organized a large and widespread corps of observers, and made arrangements for simultaneous reports by means of the electric telegraph, which was yet in its infancy. He was the first to apply the telegraph to meteorological research, to have the atmospheric conditions daily indicated on a large map,

and to utilize the generalizations made in weather forecasts, and the first to embrace a continent under a single system — British America and Mexico being included in the field of observation. From 1868 Henry continued to be annually chosen as president of the National Academy of Sciences; and he was also president of the Philosophical Society of Washington, from the date of its organization in 1871. He died at Washington, May 13, 1878.

HENRY, MATTHEW, the author of the well-known and justly popular *Exposition of the Old and New Testaments*, was born in England, October 18, 1662. He was the son of Philip Henry, one of the 2,000 ministers who were ejected from their livings in 1662 for refusing to conform to the Act of Uniformity. Unlike the majority of his fellow sufferers, Philip Henry, who, through his wife, was the possessor of private means, was spared all personal privation or hardship as the consequence of his nonconformity, and was thus enabled to give a good education to his son. Having received this preliminary education from his father and a tutor named Turner, Henry was next removed to an academy at Islington, whence he proceeded to become a student of law at Gray's Inn. His legal studies, however, had not advanced far when he relinquished them for theology, to which he thenceforth devoted himself. In 1687 he became minister of a Presbyterian congregation at Chester, whence, in 1712, he was translated to Hackney. Two years later (June 22, 1714), he died suddenly of apoplexy at Nantwich, while on a journey from Chester to London. Henry's *Exposition*, the work by which he is now chiefly remembered, is a commentary of a practical and devotional rather than of a critical kind, ranging over the whole of the Old Testament and extending into the New as far as to the end of the Acts.

HENRY, PATRICK, statesman and orator, was born at Studley, Hanover county, Va., May 29, 1736, the second son in a family of nine children. His father, John Henry, an emigrant from Aberdeen, Scotland, was a nephew of Robertson the historian, and had risen to some eminence in the country, filling the offices of surveyor and presiding magistrate. Patrick Henry was educated at a little school near his home; and, after the age of ten, by his father, who had opened a grammar school at his residence. In early life he showed no marked proficiency in his studies, except perhaps in mathematics, but was noted chiefly for a love of outdoor sports. At fifteen he became clerk in a country store; and at sixteen he entered into partnership as storekeeper with his elder brother, but the business was unsuccessful, and a second attempt at store-keeping ended likewise in failure. Meanwhile the indifference to learning which marked his boyhood was replaced by a love of history, especially that of Greece and Rome. At twenty-four, by his admission to the bar, Henry entered on the career that eventually brought him fame and fortune, although his income for some years was in keeping with his lack of previous preparation. At twenty-seven he won his first triumph, as counsel for the collector of the county, in what became known as "the parson's cause." His unexpected display of eloquence on the side of the people procured him an extravagant recognition and the title of "the orator of nature." Business poured in upon him, his popularity concealed his deficiencies; and his success was assured. In 1765 he was elected to the House of Burgesses, where he distinguished himself as the author of certain resolutions against the Stamp Act, the last of which — providing that "the General Assembly of this colony have the sole right and power to lay taxes and impositions upon the inhabitants of this colony" — though passed by a majority of only one, was

the keynote of the struggle for independence. In 1769 he was admitted to practice in the general court, where he attained eminence in criminal cases before juries. In 1773 he was a member of the "committee of correspondence for the dissemination of intelligence between the colonies." In the following year he was chosen delegate to the Virginia convention, which was the first public assembly to recommend an annual "General Congress," and to the "Old Continental Congress;" but his success there as an orator failed to conceal his defects as a practical statesman. In 1775, in the Virginia convention, he delivered a remarkable speech in moving that the "colony be immediately put in a state of defense," and at the head of a body of militia he forced the royal officials to pay £330 for powder clandestinely removed by order of Governor Dunmore. He was appointed by the convention colonel of the first regiment and commander of all the forces to be raised in Virginia, but a misunderstanding with the "committee of safety" led to his resignation. He was a member of the second Continental Congress of 1775, and of the Virginia convention of 1776, which had been elected "to take care of the republic," the royal governor having fled. They framed a new constitution, and elected Henry the first republican governor, on the first ballot. He was reelected in 1777 and 1778. In 1780 he became a member of the legislature, where he continued until he was again elected governor in 1785. In 1786 he withdrew through the pressure of debt, having "never been in easy circumstances." In 1787 he was chosen a delegate to the "Federal Constitutional Convention," but did not attend. He had resumed his practice to better his fortunes. In 1788 he was a delegate to the Virginia convention for ratifying the Federal Constitution, which he vehemently opposed as dangerous to the liberties of the country. In 1791 he declined reelection to the legislature, continuing, through necessity rather than choice, the practice of the law, but usually in great and remunerative cases only. Finally, in 1794, having not only paid his debts but secured affluence, he withdrew to private life. In 1795 he declined the position of secretary of state in Washington's cabinet, in 1796 the nomination for governor of Virginia, and in 1797 the mission to France, offered by President Adams. In 1799, however, he suffered himself to be elected to the State legislature, where he wished to oppose what he deemed the dangerous doctrine of the Virginia resolutions of 1798; but he did not take his seat, his death occurring on June 6th.

HENRY, ROBERT (1718-1790), the author of the *History of Great Britain written on a new plan*, was the son of a farmer, and was born in the parish of St. Ninians near Stirling, Scotland. For the volumes published in his lifetime Henry realized as much as £3,300, and through the influence of Lord Mansfield he was in 1781 rewarded with a pension of £100 a year from George III. In 1784 he received the degree of D.D. from the university of Edinburgh. He died in 1790 before his tenth volume was quite ready for the press.

HENRY, WILLIAM, a distinguished chemist, son of Thomas Henry, an apothecary and author of some works on chemistry, was born at Manchester, England, December 12, 1775. After completing his education at an academy in Manchester, he was for some years private secretary to a physician, and in 1795 began the study of medicine at the university of Edinburgh. For some time he practiced as a physician in Manchester, but, on account of delicate health, was ultimately compelled to retire from his profession. He nevertheless carried on his original researches in chemistry, for which he found great facilities in connection with his father's business, and from 1797 till his death he continued to

enrich the *Transactions* of the Royal Society with contributions on his favorite science, especially in regard to acrid bodies. His first communication was an attempt, in opposition to Austin, Beddoes, and others, to establish the title of carbon to rank among the elementary bodies, but, discovering afterward a fallacy in his reasoning, he corrected it in a subsequent paper. In 1800 he published in the *Philosophical Transactions* his experiments on muriatic acid gas, made with the view of disengaging an imaginary unknown element supposed to be associated with oxygen in the composition of the gas; but after the discovery of the real nature of the acid by Davy he was one of the earliest converts to the new theory. In 1803 he published his elaborate experiments on the quantity of gases absorbed by water at different temperatures and under different pressures, with the result of establishing the law that "water takes up of gas, condensed by one, two, or more additional atmospheres, a quantity which would be equal to twice, thrice, etc., the volume absorbed under common pressure of the atmosphere." In 1808 he described in the *Philosophical Transactions* a form of apparatus adapted to the combustion of larger quantities of gases than could be fired in eudiometric tubes. In the same year he was chosen a fellow of the Royal Society; and in 1809, for his valuable contributions to the *Transactions* of the society, he was awarded the Copley gold medal. For the next fifteen years he continued his experiments on the gases, making known the results of them from time to time to the Society. He died September 2, 1836.

HENRYSON, ROBERT (c. 1425–c. 1506), one of the early Scottish poets, and the author of the first specimen of the pastoral poetry of his country, is usually designated schoolmaster of Dunfermline; and according to tradition he was the ancestor of the family of Henryson or Henderson of Fordell, in the county of Fife, one of whom, James Henryson, was king's advocate and justice-clerk in 1494. Of the poet's parentage and early history, however, no certain information can be discovered.

HENSLOWE, PHILIP, a contemporary of Shakespeare, whose name continues of interest from his intimate association with the history of the theater during the great dramatist's career. Originally, it would appear, a dyer and afterward a starchmaker, and ready to turn to any profitable speculation, he probably began his connection with the stage in 1584 by becoming "joint lessee of the Rose theater on the Bankside, or of the ground on which it stood." From 1591 to his death in 1616 he was in theatrical partnership with the more famous Edward Alleyn, who in 1592 married his stepdaughter, Joan Woodward. (See ALLEYN.)

HENZADA, a district in Pegu division, British Burmah, with an area of 4,047 square miles. It is bounded on the north by the Prome district, on the east by the Pegu Yomas, on the south by Rangoon, Thonkhwa, and Bassein districts, and on the west by the Arakan Yoma range. Henzada district stretches from north to south in one vast plain, forming the valley of Irawadi, and is divided by that river into two nearly equal portions. This country is protected from inundation by immense embankments, so that almost the whole area is suitable for rice cultivation.

HEPATICA. See LIVERWORT.

HEPHAESTION, son of Amyntor, a Macedonian of Pella, is celebrated as the friend of Alexander the Great. The two, according to Quintus Curtius, were companions in childhood, but beyond this old standing connection we find no evidence of such qualities in Hephæstion as deserved the passionate attachment of Alexander. In the later campaigns of Alexander in Bactria and India,

we find Hephæstion charged with important commands. He was rewarded with a golden crown and the hand of Drypetis, the daughter of Darius and sister of Alexander's own wife Statira, (324 B.C.) In the end of the same year he died suddenly at Ecbatana.

HEPHAESTION, a grammarian of Alexandria, author of a work on Greek meters. This work is most valuable as the only complete work on the subject that has been preserved.

HEPHAESTUS, a word of uncertain derivation but certainly pre-Greek in formation, denotes among the Greeks a god who represents the power of fire and its appliance in the operations of daily life, corresponding to the Latin Vulcan.

HERA, a word of which many different derivations have been proposed, is the name of a Greek goddess, corresponding to the Latin Juno, who according to the conventional type is the wife of Zeus and queen among the gods of Olympus. In the literature of the Greeks Hera fills a very conspicuous place; the strong, haughty, and rebellious character, full of intense hatreds and likings, which was associated with her, made her a picturesque and dramatic figure. According to this conception of her, she was daughter of Cronus and Rhea, and at once sister and wife of Zeus. She was always the bitter enemy of all the heroines who were the successive objects of her husband's love, and her persecution of them and of their children often forms the theme of poets from the *Iliad* downward. This type, which is the familiar one in all literature, had never any real existence in religion; but had been gradually elaborated by poets from the actual deity worshiped in various parts of Greece, and from the legends transmitted to the Greeks from earlier races.

HERACLEA, or HERACLEIA (in French, *Héraclée*), the name of several ancient cities in various parts of the area of Greek colonization, so called in honor of Heracles or Hercules.

I. HERACLEA, a city of Magna Græcia, which lay between the rivers Aciris and Siris, not far from the shores of the Gulf of Tarentum, near the site of the modern village of Policoro. It appears to have been a joint colony of the Tarentines and Thurians, and to have risen after the destruction of the neighboring city of Siris.

II. HERACLEA, a city of Sicily, at the mouth of the Halycus (the modern Platani), not far from the promontory now known as Capo Bianco. It was distinguished from the other Heracleas by the surname of Minoa, which was explained as referring to its foundation by Minos of Crete.

III. HERACLEA PONTICA, a city on the coast of Phrygia in Asia Minor, easily identified with the modern Bender Eregli or Ereklî, at the mouth of the Kilidj-su on the Black Sea. It was founded by a Megarian colony, which soon subjugated the native tribe of the Mariandynians, and extended its power over a considerable territory. The prosperity of the city, rudely shaken by the Galatians and the Bithynians, was utterly destroyed by Aurelius Cotta in the Mithridatic war.

IV. HERACLEA SINTICA, a town in Thracian Macedonia, to the south of the Strymon, the site of which is marked by the village of Zervókhori, and identified by the frequent discovery of local coins.

V. HERACLEA, a town on the borders of Caria and Ionia, near the foot of Mount Latmus, whence it is usually distinguished as the Latmian. In its neighborhood was the burial cave of Endymion.

For Heraclea Trachinia see TRACHIS, and for Heraclea Perinthia see PERINTHUS.

Heraclea was also the name of one of the Sporades, between Naxos and Ios, which is still called Raklia, and

bears traces of a Greek township with temples to Tyche and Zeus Lophites.

HERACLEON, a Gnostic who flourished about 125 A.D., probably in the south of Italy or in Sicily, is generally classed by the early heresiologists with the Valentinian school of heresy.

HERACLES. See HERCULES.

HERACLIDES, surnamed PONTICUS, a Greek miscellaneous writer who flourished in the fourth century B.C., was born at Heraclea in Pontus. Removing to Athens, he is said to have been a disciple successively of Speusippus, Plato, and Aristotle. According to Suidas, the second of these philosophers, on departing for Sicily, left his scholars in charge of Heracles. The latter part of his life was spent at Heraclea.

HERACLITUS, of Ephesus, one of the most subtle and profound of the metaphysicians of ancient Greece, has only of late years had his true position assigned to him in the history of philosophy. The true position of Heraclitus is that of the founder of an independent metaphysical system, which sought to get rid of the difficulty, so prominent in the Eleatic philosophy, of overcoming the contradiction between the one and the phenomenal many, by enunciating, as the principle of the universe, "Becoming," implying, as it does, that everything is and at the same time, and in the same relation, is not.

HERACLIUS, emperor of the East, was born in Cappadocia about 575. He was brought into notice by his heading a successful revolt against the emperor Phocas in 610, when he usurped the usurper's throne. Heraclius appears to have set himself to the task of reorganizing both state and army, a labor which had probably occupied him since his accession. He was menaced on the west by the fierce tribe of the Avars, who were casting longing eyes on the riches of the imperial city; but, in 620, he succeeded in making a treaty with them. In 621 Heraclius led an army into camp in Asia Minor, and devoted himself with ardor to the drilling of his inexperienced troops. Next year he led his forces against Persia, and, within five years, in a series of brilliant campaigns that placed him side by side with the greatest generals of the world, he overthrew the pride of that empire, drove its monarch a fugitive from his throne, and enriched his exulting troops with untold wealth. The true cross, carried from Jerusalem by the Persians, was restored to Christian hands. Heraclius returned in triumph to Constantinople, which had in his absence two years before successfully repulsed a combined assault by the Avars and Persians; and, in 629, he proceeded to Jerusalem to restore solemnly the holy relic to its ancient place. But he was not long to enjoy the peaceful fruits of victory. A mighty power had been steadily growing up in the hot sands of Arabia, and was now coming to measure its strength with that of the Roman empire. In 632 the Mohammedans invaded Syria; and, overthrowing the armies sent to oppose them, in six years they made themselves masters of the country. Egypt next fell before Islam, and, in 640, that fair province of the empire was Mohammedan. The people of Asia Minor alone successfully resisted the advancing Saracens. Heraclius seems meanwhile to have sunk into a sort of lethargy, as though his efforts in Persia had completely exhausted him, and, in 641, he died.

HERALDRY, though etymologically denoting all the business of the herald, has long in practice been restricted to one part of it only, and may be defined as the art of blazoning or describing in proper terms armorial bearings. It treats also of their history, of the rules observed in their employment and transmission, of the manner in which by their means families and certain

dignities are represented, and of their connection with genealogies and titular rank.

Particular symbols have in all ages been assumed by the various families of mankind, civilized and uncivilized. Such were the lion of the tribe of Judah, the S. P. Q. R. upon the standards of ancient Rome, and the eagle surmounting them, the tattoo marks of the savages of America and the Pacific, the Danish raven, and the white horse of Saxony, which still remains carved upon the chalk downs of western England. Heraldry, however, is a purely feudal institution, coeval with close armor, devised possibly in Germany, adopted and improved in France, Spain, and Italy, and imported into England by the Norman invaders and settlers. Its figures have little or nothing to do with the older symbols, though these have occasionally been incorporated into its charges, and an apparent connection thus established between them. These symbols were the precursors and not the ancestors of heraldic bearings. The supposed connection, however, misled the credulous heraldic writers of the sixteenth and seventeenth centuries, and caused them to attribute coats of arms to the heroes of sacred and profane history, who were certainly as ignorant of heraldry as ever was Adam of genealogy.

"Arms" or "armories," so called because originally displayed upon defensive armor, and "coats of arms" because formerly embroidered upon the surcoat or camise worn over the armor, are supposed to have been first used at the great German tournaments, and to have reached England, though to a very moderate extent, in the time of Henry II. and Cœur de Lion. To "blazon," now meaning to describe a coat of arms, is the German "blasen," to blow as with the horn, because the style and arms of each knight were so proclaimed on public occasions. The terms employed in heraldry are, however, mostly French or of French origin. Though now matters of form and ceremonial, and subject to the smile which attaches to such in a utilitarian age, armorial bearings were once of real use and importance, and so continued as long as knights were cased in plate, and their features thus concealed. At that time leaders were recognized in the field by their insignia alone, and these—both figures and colors—became identified with their fame, from personal became hereditary, were subject to certain rules of descent, and to the laws of propriety and the less certain rules of honor.

It is uncertain at what period armorial bearings found their way into England. The Conqueror and his successors certainly did not use them; they do not appear upon their seals, nor are they shown upon the banners of the Bayeux tapestry. Stephen is said to have used a centaur, Sagittarius, as an emblem, because he landed in England when the sun was in that sign, but on his great seal his shield is quite plain, save a ridge down the center, evidently a part of its construction. On the seals of the Conqueror, Rufus, and Henry I., only the hollow or under side of the shield is shown; so there probably was no design upon the front.

No sooner had the great barons assumed arms for themselves than they began to grant them to their followers. Arms so granted commonly bore some resemblance to those of the grantor, and hence certain charges prevailed in certain districts.

The crusades, by bringing together soldiers of different nations, tended to produce a certain assimilation in their heraldries, but their influence upon the arms themselves has been exaggerated. The stories as to bearings adopted to commemorate feats of arms in Palestine are mostly inventions. The cross no doubt was a crusading bearing, but it was so because it was the emblem of Christianity, and primarily popular as such.

The diversions of the tournament did even more than actual war to promote the glories of heraldry. On these occasions the presence of spectators, and especially of ladies, encouraged all sorts of heraldic display. At a tournament at Calais in 1381 Richard Beauchamp, earl of Warwick, one of the most accomplished knights of the reigns of Richard II., Henry IV., and Henry V., suspended on three shields three several coats of arms, as representing three several knights who professed to be ready successively to meet all comers. Three French knights appeared to the challenge, and were defeated by Warwick, wearing alternately the three coats to which he was entitled.

The shield, as the most obvious piece of the defensive armor, was that upon which arms were first displayed. The Norman shield was of wood covered with hide, and clamped and stiffened in a fashion which is thought to have given rise to the first simple bearings. It was three to four feet long, pointed below, and eighteen inches broad. This shield is common on early monumental effigies armed in chain mail, and it is unusual to find it with armorial bearings. It was succeeded by the small triangular heater shield, and that, in the reign of Edward III., by a somewhat larger and full bottomed shield, which by degrees ceased to be used in war, and became more and more an architectural ornament. The arms were also displayed upon the breastplate, and upon the camise or surcoat that covered the armor, and were repeated upon the housings of horses both before and behind the saddle.

The importance attached to armorial bearings is strongly shown in the uses to which they were applied. A sovereign who wished to assert his claim to a kingdom placed its arms upon his shield. In 1479, when Alphonso of Portugal resigned his claim to Castile, he was required to lay aside his armorial ensigns. It appears that when Edward III. assumed the French lilies, he at first did so simply as representing his mother, who was an heiress, and placed her arms in his second quarter; when, however, he claimed the kingdom of France in her right, he removed the lilies to the first quarter as representing the more important kingdom. A grant of arms at the hand of a sovereign had great value.

As arms became hereditary, and their use ceased to be confined to the battle-field, but was largely extended to seals and ornaments, it was natural that some notice should be taken of the arms of females, and that the wife's coat should be combined in some way with that of the husband, especially when she was the last of, and represented, her family. This seems first to have been managed by giving the wife a separate shield. The kings of France so bore the arms of Navarre after the marriage with the heiress of that kingdom. Another very early plan was to form a composite coat.

As the combinations out of which the early coats were formed were limited, it occasionally happened that two persons of the same nation bore the same arms, and this gave rise to disputes which, as matters connected with military discipline, came under the jurisdiction of the earl marshal.

The same necessity that made it important to prevent the use of similar bearings by different families in the same country made it also necessary to distinguish between the bearings of different members of the same family, all of whom had a right to the paternal coat. As this right was strongest in the eldest son he alone bore the paternal arms unaltered (in French heraldry "*sans brisure*"); and the other sons were obliged to introduce some sufficient change, called in heraldry a "difference."

All these rules and alterations were, however, the

growth of a later age, and came into use as the bold and simple heraldry of the thirteenth and fourteenth centuries began to be overlaid with florid fancies. So long as heraldry represented a real want, its expressions were simple and intelligible, but as "villainous saltpeter" came into use and closed helmets were laid aside, and as skill and strategy, rather than personal valor, became the attribute of a leader, armorial bearings fell into disuse in war, and were no longer worn upon the person or upon the horse trappings. But though armorial bearings ceased to be of actual use, they continued to be emblems of rank and family, and a mark of gentle blood. They became, however, exceedingly and often absurdly complex, partly because simplicity was no longer necessary, and partly because it was scarcely practicable, owing to the enormous increase in the number of the gentry, which produced a demand for new combinations.

The glories of heraldry reached their zenith in the reign of Richard II., with "youth at the prow and pleasure at the helm" of the vessel of the state, but it was not till the reign of Richard III. that it was thought necessary to place under specific control the whole heraldry of the kingdom; and this, in close imitation of the example of France, was done by the incorporation of the heralds into a college, placed under the presidency of the earl marshal.

The office of the herald, as the messenger of war or peace between sovereigns, or between contending armies in the field, is of far earlier date than the introduction of armorial bearings, but as these came into use they were gradually placed under his charge, and he took his specific name sometimes from that of the noble or leader who employed him, sometimes from one of his castles or titles of honor, and sometimes from one of his badges or cognizances, which the herald wore embroidered upon his dress, and by which he was known.

A curious evidence of the vitality of heraldry, and of the desire of all mankind for ancestral distinctions, is afforded by its extension among the republics of the New World. The United States boasts some excellent genealogical societies, and a great and very general desire is shown by individuals to trace their pedigrees to the stocks of the Old World, and to assume the arms proper to their name. The national emblem of the stars and stripes, now so widely and honorably known throughout the world, has been traced back to the paternal coat of the first and greatest president, George Washington, whose English ancestors bore "argent, two bars gules, in chief three mullets of the second." In Canada, Australia, and other English colonies, the assumption of arms by individuals and by the community is not less general; and the republics of South America, of Spanish origin, almost all have adopted coats of arms. The Peak of Teneriffe, the Beaver, the Red Indian, contribute to the list of charges, and the clear firmament of Chili is indicated by a star. "*Coupé d'azur sur gules, à une étoile d'argent en abime.*"

HERAT is a city of great interest both historically and geographically, and is of even greater interest politically, its importance at the present day being indicated by its popular designation of the "key of India." Its origin is lost in antiquity. We can only infer, from the colossal character of the earthworks which surround the modern town, that, like the similar remains at Bost on the Helmand and at Ulán Robát of Arachosia, they belong to that period of Central-Asian history which preceded the rise of Achaemenian power, and which in Grecian romance is illustrated by the names of Bacchus, of Hercules, and of Semiramis.

The natural advantages of Herat are mainly due to its river, which, rising in the high uplands 350 miles to

the eastward, passes in the upper part of its course through a succession of rolling downs of the finest pasture-land, and lower down traverses a more contracted valley, enlivened, however, throughout with smiling villages and orchards, till it reaches the eastern limit of the alluvial plain of Herat. Here at the present day nine large canals (in former times there were twenty) carry off the waters of the Heri-rūd for the irrigation of the circumjacent plain, which on a rough calculation may be said to contain nearly 400 square miles of land available for cultivation.

The city of Herat is very centrally situated, great lines of communication radiating from it in all directions—southward to Seistan (200 miles), southeastward to Kandahar (370 miles), eastward to Cabul (550 miles), northward by Mymenah to Bokhara (600 miles), and by Merv to Khiva (700 miles), while to the westward four routes lead into Persia by Turbat to Meshed (215 miles), and by Birjend to Kermān (400 miles), to Yazd (500 miles), or to Ispahān (600 miles). The city forms a quadrangle of nearly a mile square (more accurately about 1,600 yards by 1,500 yards); on the western, southern and eastern faces the line of defense is almost straight, the only projecting points being the gateways, but on the northern face the contour is broken by a double outwork, consisting of the *Ark* or citadel, which is built of sun-dried brick on a high artificial mound within the enceinte, and a lower work at its foot, called the *Ark-i-now*, or "new citadel," which extends 100 yards beyond the line of the city wall. That which distinguishes Herat from all other Oriental cities, and at the same time constitutes its main defense, is the stupendous character of the earthwork upon which the city wall is built. This earthwork averages 250 feet in width at the base and about fifty feet in height, and as it is crowned by a wall twenty-five feet high and fourteen feet thick at the base, supported by about 150 semicircular towers, and is further protected by a ditch forty-five feet in width and sixteen in depth, it presents an appearance of imposing strength. Whether the place is really as strong as it looks has been differently estimated. General Ferrier, who resided for some time in Herat, states that the city is nothing more than an immense redoubt, and gives it as his opinion that as the line of wall is entirely without flanking defenses, the place could not hold out for twenty days against a European army; and M. Khanikoff, who, though not a professional soldier, was a very acute observer, further remarks that the whole interior of the city is dominated from the rising ground at the northeast angle, while the water supply both for the ditch and the city would be at the mercy of an enemy holding the outside country, the wells and reservoirs inside the wall, which would then be alone available, being quite inadequate to the wants of the inhabitants; but on the other hand all experience testifies to the defensibility of the position. Not to speak of the sieges which Herat sustained at the hands of Jenghiz Khan, of Timur, and of Ahmed Shah, we have only to remember that in 1837 the Afghans of Herat beat off the continuous attack for nearly ten months of a Persian army of 35,000 regular troops, supported by fifty pieces of artillery, and in many cases directed and even commanded by Russian officers. The truth seems to be that Herat, though in its present state quite unfit to resist a European army, possesses great capabilities of defense, and might by a skillful adaption of the resources of modern science be made almost impregnable.

The city possesses five gates, two on the northern face, the Kutab-chak near the northeast angle of the wall, and the Malik at the reëntering angle of the *Ark-i-now*; and three others in the centers of the remaining faces, the Irāk gate on the west, the Kandahar gate on

the south, and the Khushk gate on the east face. Four streets called the *Chahar-sik*, and running from the center of each face, meet in the center of the town in a small domed quadrangle. The principal street runs from the south or Kandahar gate to the market in front of the citadel, and is covered in with a vaulted roof through its entire length, the shops and buildings of this bazaar being much superior to those of the other streets, and the merchants' caravanserais, several of which are spacious and well built, all opening out on this great thoroughfare. Near the central quadrangle of the city is a vast reservoir of water, the dome of which is of bold and excellent proportions. It is stated by General Ferrier to have been constructed by command of Shah Abbas, and to be a *chef d'œuvre* of its kind. It is supposed to contain above a twelve months' supply of water for the entire city, but, as M. Khanikoff observes, it is within easy mortar range of the high ground at the northeast angle of the city, and might thus be destroyed by a few well-directed shells, in which case the ruins of the dome would fill up the basin and the water supply would be lost. The only other public building of any consequence in Herat is the great mosque or *Mesjid-i-juma*, which comprises an area of 800 yards square, and must have been a most magnificent structure. At the present day, with the exception of the *Chahar-sik*, where there is always a certain amount of traffic, and where the great diversity of race and costume imparts much liveliness to the scene, Herat presents a very melancholy and desolate appearance. The mud houses in rear of the bazaars are for the most part uninhabited and in ruins, and even the burned brick buildings are becoming everywhere dilapidated. The city is besides one of the filthiest in the East, as there are no means of drainage or sewerage, and garbage of every description lies in heaps in the open streets. Since 1863 Herat has been a provincial city governed from Cabul, and its average population has ranged between 20,000 and 30,000, within which limits must be confined its present estimate.

In actual territory the province of Herat extends east and west from near the sources of the Heri-rūd about 300 miles to the Persian frontier beyond Ghorian, and north and south from the Merv boundary, in about 36° latitude, 200 miles to the northern limit of Seistan. The inhabitants of the city of Herat are for the most part Shiāhs, and in regard to language and habits, as well as religion, are Persians rather than Afghans. There are, however, both in the town and in the neighboring villages a certain number of Afghan colonists, who have been settled there—the greater part by Nadir Shah—during the last 150 years, as well as Hazārehis, Jamshidis and Taimenis, with a fair sprinkling of Hindus and some forty families of Jews. The net revenue of the valley and its immediate dependencies in ordinary times is under £100,000 per annum, but the vizier Yar Mahomed Khan is supposed in the plenitude of his power, and when he had for a time brought a great part of Seistan under his sway, to have realized double that amount from the entire province.

To trace in any detail the fortunes of Herat would be to write the modern history of the East, for there has hardly been a dynasty revolution, or a foreign invasion, or a great civil war in Central Asia since the time of the Prophet, in which Herat has not played a conspicuous part and suffered accordingly. Under the Tahirides of Khorassan, the Soffarians of Seistan, and the Samanides of Bokhara, it flourished for some centuries in peace and progressive prosperity; but during the succeeding rule of the Ghaznevide kings its metropolitan character was for a time obscured by the celebrity of the neighboring capital of Ghazni, until finally in the reign of

Sultan Sanjar of Merv about 1157 the city was entirely destroyed by an irruption of the Ghoz, the predecessors, in race as well as in habitat, of the modern Turcomans. Herat gradually recovered under the enlightened Ghoriide kings. But the Moghul visitation was most calamitous; forty persons, indeed, are stated to have alone survived the general massacre of 1232, and as a similar catastrophic overtook the city at the hands of Timur in 1398, it is astonishing to find that early in the fifteenth century Herat was again flourishing and populous, and the favored seat of the art and literature of the East. It was, indeed, under the princes of the house of Timur that most of the noble buildings were erected, of which the remains still excite our admiration at Herat. Four times was Herat sacked by Turcomans and Uzbeks during the centuries which intervened between the Timuride princes and the rise of the Afghan power, and it has never in modern times attained to anything like its old importance. It will be needless to trace the revolutions and counter-revolutions which have followed each other in quick succession at Herat since Ahmed Shah Duráni founded the Afghan monarchy about the middle of the last century. Let it suffice to say that Herat has been throughout the seat of Afghan government, sometimes in subordination to Cabul, and sometimes independent. Persia, indeed, for many years showed a strong disposition to reassert the supremacy over Herat, which was exercised by the Saffavay kings, but Great Britain, disapproving of the advance of Persia toward the Indian frontier, steadily resisted the encroachment; and, indeed, after helping the Heratis to beat off the attack of the Persian army in 1838, the British at length compelled the Shah in 1857 at the close of his war with them to sign a treaty recognizing the future independence of the place, and pledging Persia against any further interference with the Afghans. In 1863 Herat, which for fifty years previously had been independent of Cabul, was incorporated by Dost Mahomed Kahn in the Afghan monarchy, but he died there June 9, 1863, and was succeeded by his son, Shere Ali Khan. The latter, after much fighting, during which at one time (1867) he held only Balkh and Herat, made his power solid over Afghanistan. In 1878-79 Lord Lytton, then governor-general of India, picked a quarrel with Shere Ali, and sent an army to Kandahar; Shere Ali fled to Russian territory, and died there February 20, 1879. His son and successor, Yakub Khan, made a treaty with the English at Gundamuk, by which England secured the Khybar Pass and the right to maintain a permanent embassy in Cabul. Maj. Louis Cavagnari entered Cabul as ambassador in July, and was slain in the streets a month later. Herat fell into the hands of the war party, and the English, under General Roberts, made another advance into Cabul. Yakub Khan was arrested and deposed; the British occupied Kandahar and proclaimed Shere Ali prince of that district. Ayub Khan defeated the English forces under the walls of Kandahar July 26th, but was in turn defeated by Roberts a month later. Owing to the overthrow of the Beaconsfield ministry in England, and the accession of the Liberals to power, the plans were changed, and the British instead of holding the fortified places proclaimed Abdur-Rahman Kahn, son of Dost Mahomed, as emir of Afghanistan, and evacuated the country in the summer of 1881. Ayub Khan raised an army with the help of Russia, and again took Kandahar in July, 1881, but the reigning emir retook the city, and on October 13th captured Herat and ended the war. Abdur-Rahman now reigns over the same country as was governed by his grandfather.

HÉRAULT, a department in the south of France,

formed from parts of the old province of Languedoc, is bounded on the northeast by Gard, northwest by Aveyron and Tarn, and south by Aude and the Gulf of Lyons. It has an area of 2,444 square miles, and a population of nearly half a million. Its greatest length is eighty-four miles, and its greatest breadth fifty. About a third of the department consists of moorland, heath, and common, a fourth of arable land, a sixth of vineyards, and an eighth of wood. The southern prolongation of the Cevennes mountains forms the north boundary of the department. The highest point is about 4,250 feet above the sea-level. The ridge forms the watershed between the waters of the Atlantic and the Mediterranean, and from it there flow the Vidourle, Mosson, Hérault, Livron, and Orb. The department has Montpellier for its capital, and is divided into the arrondissements of Montpellier, Béziers, Lodève, and St. Pons, with thirty-six cantons and three hundred and thirty-one communes.

HERBARIUM, or **HORTUS SICCUS**, a collection of plants so dried and preserved as fully to illustrate their several specific characters. Since the same plant, owing to peculiarities of climate, soil, and situation, degree of exposure to light, and other influences, may vary greatly according to the locality in which it occurs, it is only by gathering together for comparison and study a large series of examples of each species illustrative of the flora of different regions that the laws of vegetable morphology, and many more points of scientific interest, can be satisfactorily determined. Thus, from the herbarium may be acquired a knowledge of those details concerning the minuter structure of individual plants which are of necessity omitted in works of systematic botany, as also of the relative taxonomic importance of the characters to be met with in large groups of forms.

The collection of the Royal Herbarium at Kew, generally acknowledged to be at once the most extensive and the best preserved and most orderly in the world, comprises some 100,000 species, many of them represented by numerous specimens. It is arranged, for easy reference, in cases situate between the windows of the building containing it, the atmosphere of which is kept dry by means of hot-water pipes. In the intervening spaces are tables for the purpose of study, which is further facilitated by the presence in the same building of a large and valuable botanical library. Next in importance is the herbarium of the British Museum, which comprises assemblages of specimens gathered by numerous eminent botanists. The collection of Dillenius is deposited at Oxford, and that of the late Professor Harvey at Trinity College, Dublin. The original herbarium of Linnaeus is in the possession of the Linnean Society of London. With the more important British herbaria are to be ranked also those of Cambridge and Edinburgh. The collections of Jussieu and St. Hilaire are included in the large herbarium of the Jardin des Plantes at Paris, and in the same city is the extensive private collection of Doctor Cosson. At Geneva are three large collections. The university of Göttingen has had bequeathed to it the largest collection (exceeding 40,000 specimens) ever made by a single individual—that of the late Professor Grisebach. At the herbarium in Brussels are the specimens obtained by the traveler Martius. Other national herbaria sufficiently extensive to subserve the requirements of the systematic botanist exist at Berlin, St Petersburg, Vienna, Leyden, Stockholm, Upsala, Copenhagen, and Florence. Of those in the United States of America, the chief, formed by Asa Gray, is the property of Harvard university; others are to be seen at Yale and Columbia colleges and at New York and Michigan universities. The herbarium at

Melbourne, Australia, under Baron Müller, has attained large proportions; and that of the Botanical Garden of Calcutta is noteworthy as the repository of numerous specimens described by writers on Indian botany.

HERBART, JOHANN FRIEDRICH, was born at Oldenburg in 1776. He showed his bent toward philosophy while still a child, and after studying under Fichte at Jena gave his first philosophical lectures at Göttingen in 1805, whence he removed in 1809 to occupy the chair formerly held by Kant at Königsberg. Here he also established and conducted a seminary of pedagogy till 1833, when he returned once more to Göttingen, and remained there as professor of philosophy till his death in 1841.

HERBELOT, BARTHELEMY D', Orientalist, was born December 4, 1625, at Paris. He devoted himself to the study of the Oriental languages, and went to Italy to perfect himself in them by converse with the Orientals who frequented its seaports. There he made the acquaintance of his fellow-savants, Lucas Holstenius and Leo Allatius, and attracted the favorable notice of the cardinals, Grimaldi and Bamberini. On his return to France after a year and a half, he was received into the house of Fouquet, superintendent of finance, who gave him a pension of 1,500 livres. In 1661, he was appointed secretary and interpreter of Eastern languages to the king. A few years later he again visited Italy, when the grand-duke Ferdinand II. of Tuscany presented him with a large number of valuable Oriental MSS., and tried to attach him to his court. Herbelot, however, was recalled to France by Colbert, and in 1692 succeeded D'Auvergne in the chair of Syriac, in the Collège de France. He died at Paris, December 8, 1695. His great work is the *Bibliothèque Orientale*, which occupied him nearly all his life, and was published in 1697 by Galland.

HERBERT, GEORGE, one of the best of English religious poets, was born near the town of Montgomery on April 3, 1593. He was a brother of Lord Herbert of Cherbury, noticed below. Educated privately till the age of twelve, he was then sent to Westminster School, and in 1608 he became a student at Trinity College, Cambridge, where he was made B.A. in 1611, M.A. and major fellow of the college in 1615, and orator for the university in 1619. In his capacity as orator he was several times brought into contact with King James. He numbered among his friends Doctor Donne, Sir Henry Wotton, Izaak Walton, Bishop Andrews, and Francis Bacon, who consulted Herbert about several of his works, and dedicated to him his translation of the Psalms. During his youth he was a courtier. In July, 1626, he was appointed prebendary of Layton Ecclesia, in the county of Huntingdon. The story of the poet's life at Bamerton, as told by Walton, is one of the most exquisite pictures in literary biography. He devoted much time to explaining the meaning of the various parts of the Prayer-Book, and held services twice every day, at which many of the parishioners attended, and some "let their plough rest when Mr. Herbert's saint's-bell rung to praise, that they might also offer their devotion to God with him." Next to Christianity itself he loved the English Church. He was passionately fond of music, and usually went twice a week to attend the cathedral service at Salisbury. He died in 1633.

HERBERT, HENRY WILLIAM, novelist and writer on sports, son of Hon. and Rev. William Herbert, dean of Manchester, a son of the first earl of Carnarvon, was born in London, April 7, 1807. He was educated at Eton and at Caius College, Cambridge, where he graduated M.A. in 1828. He emigrated to America, and from 1831 to 1839 was teacher of Greek

in a private school in New York. In 1833 he commenced the *American Monthly Magazine*, which he edited till 1835. In 1834 he published his first novel, *The Brothers, a Tale of the Fronde*, which was followed by a number of others, all of them obtaining a certain degree of popularity. He was also successful in a series of historical studies, such as *The Cavaliers of England, The Knights of England, France, and Scotland, The Chevaliers of France, and The Captains of the Old World*, and wrote numerous contributions to magazines; but he is best known for his works on sporting, published by him under the pseudonym of Frank Forester. These include *The Field Sports of the United States and British Provinces* (1849), *Frank Forester and his Friends* (1849), *The Fish and Fishing of the United States* (1850), *The Young Sportsman's Complete Manual*, and *The Horse and Horsemanship in the United States and British Provinces of North America* (1858). Herbert was a man of varied accomplishments. He died by his own hand at New York, May 17, 1858.

HERBERT, SIR THOMAS, traveler and author, was born at York in 1606, and died in 1682.

HERBERT, LORD, OF CHERBURY. Edward Herbert, soldier, diplomatist, historian, and religious philosopher, was born at Eytton, in Shropshire, in 1582, and was descended from an ancient line of illustrious soldiers, to which the earls of Pembroke belonged. Sent to Oxford in his twelfth year, he married an heiress, his kinswoman, in his fifteenth, and returned to the university to prosecute his "beloved studies." He was knighted soon after the accession of James I., and for a year or two fulfilled the functions of sheriff of his county. In 1608 he went abroad, at Paris gaining the esteem and love of the old Constable de Montmorency, and beginning an acquaintance with scholars like Casaubon, Gassendi, and Grotius. Next year he served as a volunteer in the Low Countries under the prince of Orange, whose intimate friend he became, and also took part in the campaigns of 1614 and 1615. Between the latter campaigns he visited Italy, and on his return was arrested in France for recruiting Huguenots for the service of the duke of Savoy. In 1618 he was sent as ambassador extraordinary to the court of France; and, though recalled for a few months through the hostility of the French king's favorite, he soon returned to Paris as ordinary ambassador. In 1625 he came back to England, where, with the exception of one or more visits to Paris, he spent the rest of his life. He died August 20, 1648.

HERBS, or HERBACEOUS PLANTS, in botany, are those in which no persistent woody stem is formed above ground. In some, the stem is woody but still annual. There is, however, in many, a permanent woody rhizome or root-stock. In books of gardening, plants used only for flavoring are sometimes distinguished as *sweet herbs*, as mint, basil, etc.; while those valued for their nutritive qualities are known as *pot herbs*.

HERCULANEUM. The ruins of the buried city of Herculaneum are situated about two-thirds of a mile from the Portici station of the railway from Naples to Pompeii. They are less frequently visited than the ruins of the latter city, not only because they are smaller in extent and of less obvious interest, but also because they are more difficult of access. The small part of the city which has been restored to the light of day in the spot called *the new excavations*, was discovered in the present century. But the more important works were executed in the last century; and of the buildings then explored at a great depth, by means of tunnels, none are visible except the theater, the orchestra of which lies eighty-five feet below the surface of the soil.

The brief notices of the classical writers inform us that Herculaneum was a small city of Campania, between Neapolis and Pompeii, that it was situated between two streams at the foot of Vesuvius, on a hill overlooking the sea, and that its harbor was at all seasons safe. With regard to its earlier history nothing is known. It enjoyed great prosperity toward the close of the republic and in the earlier times of the empire, since many noble families of Rome settled this pleasant spot for the construction of splendid villas, one of which indeed belonged to the imperial house. In the year 63 A.D., it suffered terribly from an earthquake. Hardly had it completed the restoration of some of its principal buildings when it fell beneath the great eruption of the year 79, described by Pliny the younger, in which Pompeii also was destroyed with other flourishing cities of Campania. According to the commonest account, on August 23d of that year, Pliny the elder, who had command of the Roman fleet at Misenum, set out to render assistance to the soldiers stationed at Retina, near Herculaneum, as there was no escape except by sea, but the little harbor having been on a sudden filled up so as to be inaccessible, he was obliged to abandon to their fate those people of Herculaneum and Retina who had managed to flee from their houses, overwhelmed in a moment by the material poured forth by Vesuvius. But the text of Pliny the younger, where this account is given, has been subjected to various interpretations; and from the comparison of other classical testimonies and the study of the excavations it has been concluded that it is impossible to determine the date of the catastrophe. The opinion that immediately after the first outbreak of Vesuvius a torrent of lava was ejected over Herculaneum was refuted by the scholars of the last century, and their refutation has been recently confirmed by Beulé. From Torre Annunziata (which is believed to be the site of the ancient Oplontii) to San Giovanni a Teduccio, for a distance of about nine miles, there flowed a muddy eruption which in Herculaneum and the neighboring places, where it was most abundant, raised the level of the country more than sixty-five feet. The matter transported consisted of soil of various kinds,—sands, ashes, fragments of lava, pozzolana, and whitish pumice, inclosing grains of uncalcined lime, similar in every respect to those of Pompeii. In the part of Herculaneum already excavated, the corridors in the upper portions of the theater are compactly filled, up to the head of the arches, with pozzolana and pumice transformed into tuff (which proves that the formation of this stone may take place in a comparatively short time). Tuff is also found in the lowest part of the city toward the sea in front of the few houses that have been discovered; and in the very high banks that surround them, as also in the lowest part of the theater, there are plainly to be seen earth, sand, ashes, fragments of lava and pumice, with little distinction of strata, almost always confused and mingled together, and varying from spot to spot in degree of compactness. It is clear that this immense congeries of earth and stones could not flow in a dry state over those five miles of country (in the beginning very steep, and at intervals almost level), where certainly it would have been arrested and all accumulated in a mound; but it must have been borne along by a great quantity of water, the effects of which may be distinctly recognized, not only in the filling and choking up even of the most narrow, intricate, and remote parts of the buildings, but also in the formation of the tuff, in which water has so great a share; for it cannot be supposed that enough of it has filtered through so great a depth of earth. The torrent ran in a few hours to the sea, and formed that shallow or

lagoon called by Pliny *Subitum Vadum*, which prevented the ships approaching the shores. Hence it is that, while many made their escape from Pompeii (which was overwhelmed by the fall of the small stones and afterward by the rain of ashes), comparatively few can have managed to escape from Herculaneum, and these, according to the interpretation given to the inscription preserved in the National Museum, found shelter in the neighboring city of Neapolis, where they inhabited a quarter called that of the buried city. The name of Herculaneum, which for some time remained attached to the site of the disaster, is mentioned in the later itineraries; but in the course of the Middle Ages all recollection of it perished.

In 1709, while Prince Elbeuf of the house of Lorraine, in command of the armies of Charles VI., was seeking crushed marble to make plaster for his new villa near Portici, he learned from the peasants that there were in the vicinity some pits from which they not only quarried excellent marble, but had extracted many statues in the course of years (see Jorio, *Notizia degli scavi d'Ercolano*, Naples, 1827). In 1738, while Col. D. Rocco de Alcubierre was directing the works for the construction of the *Realí Delizie* at Portici, he received orders from Charles III. to begin excavations on the spot where it had been reported to the king that the Elbeuf statues had been found. At first it was believed that a temple was being explored, but afterward the inscriptions proved that the building was a theater. This discovery excited the greatest commotion among the scholars of all nations; and many of them hastened to Naples to see the marvelous statues of the Balbi and the paintings on the walls. But everything was kept private as the government wished to reserve to itself the right of illustrating the monuments. The antiquities excavated at Herculaneum in the last century form a collection of the highest scientific and artistic value. There are marble statues of astonishing art and perfect preservation, of which it is sufficient to mention the two equestrian statues of the Balbi (*Museo Borbonico*, vol. ii., pl. xxxviii.-ix.) and the so-called statue of Aristocles. With the exception of a few pieces, nearly all the great bronzes of the museum belong to Herculaneum. It is thence that we have obtained the reposing Hermes, the drunken Silenus, the sleeping Faunus, the dancing girls, the bust called Plato's, that believed to be Seneca's, the two quoit-throwers or discoboli, and so many masterpieces more, figured by the academicians in their volume on the bronzes. Mural paintings of extraordinary beauty were also discovered, such as those that represent Theseus after the slaughter of the Minotaur, and Chiron teaching Achilles the art of playing on the lyre.

HERCULES (Old Latin, *Heracles*, *Hercles*) is the Latinized form of the mythical Heracles, the chief national hero of Hellas, who has part in all the most important myths of the generation before that which embraces the Homeric warriors at Troy. The name Heracles is compounded of *Hera*, the goddess, and the stem of *Cleos*, "glory." The thoroughly national character of Heracles is shown by his being the mythical ancestor of the Dorian dynastic tribe, while revered by Ionian Athens, Lelegian Opus, and Æolo-Phœnician Thebes, and closely associated with the Achæan heroes Peleus and Telamon. The Persæid Alcmena, wife of Amphitryon of Tiryns, was Hercules' mother, Zeus his father (see **ALCMENE**). After his putative father he is often called Amphitryoniades, and Alcides too, after the Persæid Alcæus, father of Amphitryon. His mother and her husband lived at Thebes in exile as guests of King Creon. By the craft of Hera, his foe through life, his birth was delayed, and that of Eurystheus, son of

Sthenelus of Argos, hastened, Zeus having in effect sworn that the elder of the two should rule the realm of Perseus. Hera sent two serpents to destroy the new-born Hercules, but he strangled them. He was trained in all manly accomplishments by heroes of the highest renown in each, until he slew Linus, his instructor in music, with the lyre. Thereupon he was sent to tend Amphitryon's oxen, and at this period slew the lion of Mount Citheron. By the subjection of the Minyans of Orchomenus he won Creon's daughter, Megara, to wife. Her children by him he killed in a frenzy induced by Hera. After purification he was sent by the Pythia to serve Eurystheus. The apologue of Prodicus on the *Choice of Hercules* between pleasure and virtue was founded on his obedience to the oracle. Thus began the cycle of the twelve labors:

1. Wrestling with the Nemean lion.
2. Destruction of the Lernean hydra.
3. Capture of the Arcadian hind (a stag in art).
4. Capture of the boar of Erymanthus, while chasing which he fought the Centaurs and killed his friends Chiron and Pholus, this homicide leading to Demeter's institution of *mysterics*.
5. Cleansing of the stables of Augeas.
6. Shooting the Stymphalian birds.
7. Capture of the Cretan bull subsequently slain by Theseus at Marathon.
8. Capture of the man-eating mares of the Thracian Diomedes.
9. Seizure of the girdle of Hippolyte, queen of the Amazons.
10. Bringing the oxen of Geryones from Erythia in the far west, which errand involved many adventures in the coast lands of the Mediterranean, and the setting up of the "Pillars of Hercules" at the Straits of Gibraltar.
11. Bringing the golden apples from the garden of the Hesperides.
12. Carrying Cerberus from Hades to the upper world.

On Hercules' return to Thebes he gave his wife Megara to his friend and charioteer Iolaus, son of Iphicles, and by beating Eurytus of Œchalia and his sons in a shooting match won a claim to the hand of his daughter Iole, whose family, however, except her brother Iphitus, withheld their consent to the union. Iphitus persuaded Hercules to search for Eurytus' lost oxen, but was killed by him at Tiryns in a frenzy. He consulted the Pythia about a cure for the consequent madness, but she declined to answer him. Whereupon he seized the oracular tripod, and so entered upon a contest with Apollo, which Zeus stopped by sending a flash of lightning between the combatants. The Pythia then sent him to serve the Lydian queen Omphale. He then, with Telamon, Peleus, and Theseus, took Troy. He next helped the gods in the great battle against the giants. He took part in the Argonautic voyage and the Calydonian boar hunt, made war against Augeas, and against Nestor and the Pylians, and restored Tyndareus to the sovereignty of Lacedæmon. He sustained many single combats, one very famous struggle being the wrestling with the Libyan Antæus, son of Poseidon and Ge (Earth), who had to be held in the air, as he grew stronger every time he touched his mother, Earth. Hercules withstood Ares, Poseidon, and Hera, as well as Apollo. The close of his career is assigned to Ætolia and Trachis. He wrestles with Achelous for Deianeira ("destructive to husband"), daughter of Ceneus, king of Calydon, vanquishes the river god, and breaks off one of his horns, which as a horn of plenty is found as an attribute of Hercules in art. Driven from Calydon for homicide, he goes with Deianeira to Trachis. On the way he slays the centaur Nessus, who persuades Deianeira that his blood is a love-charm. From Trachis he wages successful war against the Dryopes and Lapithæ as ally of Ægimius king of the Dorians, who promised him a third of his realm, and after his death adopted Hyllus, his son by Deianeira. Finally Hercules attacks Eurytus, takes Œchalia, and carries off Iole. Thereupon Deianeira, prompted by love and jealousy, sends

him a tunic dipped in the blood of Nessus, and the unsuspecting hero puts it on just before sacrificing at the headland of Ceneam in Eubœa. Mad with pain, he seizes Lichas, the messenger who had brought the fatal garment, and hurls him on the rocks; and then he wanders in agony to Mount Æta, where he mounts a pyre, which, however, no one will kindle. At last Pœas, father of Philoctetes, takes pity on him, and is rewarded with the gift of his bow and arrows. The immortal part of Hercules passes to Olympus, where he is reconciled to Hera and weds her daughter Hebe.

HERDER, JOHANN GOTTFRIED VON, one of the most prolific writers that Germany has produced, was born in Mohrungen, a small town near Königsberg, in 1744. Like his contemporary Lessing, with whose literary aims his own had so much in common, Herder had throughout his life to struggle against adverse circumstances. In 1762, at the age of eighteen, he went to Königsberg with the intention of studying medicine, but finding himself unequal to the operations of the dissecting-room, he abandoned this object, and by the help of one or two friends and his own self-supporting labors, followed out his earlier idea of the clerical profession by joining the university. There he came under the influence of Kant, who was just then passing from physical to metaphysical problems. Without becoming a disciple of Kant, the young Herder was deeply stimulated to fresh critical inquiry by that thinker's revolutionary ideas in philosophy. To Kant's lectures and conversations he further owed something of his large interest in cosmological and anthropological problems. Among the writers whom he most carefully read were Plato, Hume, Shaftesbury, Leibnitz, Diderot, and Rousseau. Another personal influence under which he fell at Königsberg, and which was designed to be far more permanent, was that of Hamann, the "northern Mage." Soon after this he got a double appointment at Riga, as assistant master at the cathedral school, and as curate to the suburban churches. In this busy commercial town, in somewhat improved pecuniary and social circumstances, he developed the main ideas of his writings. It the year 1767 he published his first considerable work, *Fragmente über die neuere deutsche Literatur*, which at once made him widely known and secured for him the favorable interest of Lessing. From this time he continued to pour forth a number of critical writings on literature, art, etc. He was much carried away at this time by the idea of a radical reform of social life in Livonia, which (after the example of Rousseau) he thought to effect by means of a better method of school-training. With this plan in view he began (1769) a tour through France, England, Holland, etc., for the purpose of collecting information respecting their systems of education. His new duties led him to Strasburg, where he met the young Goethe, on whose poetical development he exercised so potent an influence. At Darmstadt he made the acquaintance of Caroline Flachsland, to whom he soon became betrothed, and who for the rest of his life supplied him with that abundance of consolatory sympathy which his sensitive and rather querulous nature appeared to require. The engagement as tutor did not approve an agreeable one, and he soon threw it up (1771) in favor of an appointment as court preacher and member of the consistory at Bückeburg. For some time he had been greatly interested by the poetry of the north, more particularly Percy's *Reliques*, the poems of "Ossian" (in the genuineness of which he like many others believed), and the works of Shakespeare. Under the influence of this reading he now finally broke with classicism and became the leader of the new "Sturm und Drang" movement. He coöperated with a band of young writers at Darmstadt and Frankfort, including

Goethe, who in a journal of their own sought to diffuse the new ideas of Herder. His marriage took place in 1773. In 1776 he obtained through Goethe's influence the post of upper court preacher and upper member of the consistory at Weimar, where he passed the rest of his life. There he enjoyed the society of Goethe, Wieland, Jean Paul (who came to Weimar in order to be near Herder), and others; the patronage of the court, with whom as a preacher he was very popular, and an opportunity of carrying out some of his pet ideas of school reform. Yet the social atmosphere of the place did not suit him. His personal relations with Goethe again and again became embittered. While during the last years of his life he produced much that is of little value, he wrote also some of his best works, among others his collection of popular poetry, *Stimmen der Völker*; his most notable original poem, the *Cid*; his celebrated work on Hebrew poetry, *Vom Geist der hebräischen Poesie*; and his *opus magnum*, the *Ideen zur Philosophie der Geschichte*. Toward the close of his life he occupied himself like Lessing with speculative questions in philosophy and theology. The boldness of some of his ideas cost him some valuable friendships, as that of Jacobi, Lavater, and even his early teacher Hamann. He died in the year 1803, full of new literary plans to the very last.

HEREFORD, an inland English county on the south Welsh border, is bounded on the north by Salop, south by Monmouthshire and Gloucestershire, east by Worcestershire, and west by Radnorshire and Brecknockshire. Its circular shape is indented by spurs of adjacent counties, and its outlying parts have been incorporated with the counties in which they are situated. Its greatest length from Ludford by Ludlow to the Downard Hills, near Monmouth, is thirty-eight miles; its greatest breadth from Cradley to Clifford, near Hay, thirty-five. Its area according to the census of 1871 is 532,898 statute acres, or 832 square miles. It is divided into eleven hundreds and 221 parishes, and is a bishop's see, of which the cathedral city is the center of the county. Population, (1901), 114,150.

HEREFORD, the capital city of the above county, is situated on the left bank of the Wye, which is crossed there by a bridge of six arches. The see of Hereford was detached from Lichfield in 673, Putta being its first bishop. The city was incorporated in 1189 by Richard I., and is governed by a municipal council, consisting of a mayor, six aldermen, and eighteen councilors. It has no manufactures. Its population is about 25,000.

HERENCIA, a town of Spain in the province of Ciudad Real, New Castile, is situated in a fertile, hilly region, near the junction of the rivers Giguela and Valdespino, about eighty miles south of Madrid. Population about 8,000.

HEREKOLAND, or DAMARALAND, a region of Southwestern Africa, stretching north from the Kuisip to the Cunene, so called from the native race known to the Namaqua as Herero and to the Cape colonists as Damara (Dama, or Dama). The northwest portion is also known as Kaokoland. The population is about 200,000.

HERESY is the English equivalent of the Greek word, which has had a somewhat varied ecclesiastical use. The first employment of the word in the New Testament is to denote a sect or school of opinion among the Jews. We read of the *heresy* of the Sadducees, the *heresy* of the Pharisees, and St. Paul speaking to Agrippa says, "After the strathest *heresy* of our religion I lived a Pharisee." Christianity itself was in the beginning looked upon as one of those sects or schools of Jewish opinion, and the "*heresy*" of the Nazarenes is spoken of as well as the *heresy* of the

Pharisees. This use of the term is plainly borrowed from classical Greek, where *αἵρεσις* frequently means a school of Roman jurists or a school of philosophy. In the New Testament the word is used in another sense which is purely ecclesiastical. Thus in Titus iii. 10 the apostle says: "A man who is an *heretic* after the first and second admonition reject;" in 2 Pet. ii. 1 the church is warned against false teachers, "who privily shall bring in damnable *heresies*, even denying the Lord that bought them," and these heretics and false teachers are evidently the same as those of whom Paul, in the Epistle to the Galatians, says that they are to be anathematized. They are men who in the name of Christ preach such doctrines as tend to frustrate the grace of Christ, who preach "another gospel;" they are compared to the false prophets of the Old Testament Scriptures; they cause divisions and schism in the church; and the heresies they are guilty of are classed along with grave moral offenses. It is this second New Testament use of the word which was taken over into ecclesiastical terminology, and it is in this sense that the early Christian writers speak of *heresy* and *heretics*. This early ecclesiastical use has continued down to the present, save that in earlier times schism was generally included under *heresy*, the names and the things not being separated by definition.

Hersey means a grave error in matters of faith, but it is much more than a theological or ecclesiastical term. From the days of the emperor Theodosius at the latest, the Christian religion has been intimately connected with law, and *heresy* is a legal term, with a definite meaning attaching to it; a *heresy* was a crime with punishment annexed, and therefore was capable of legal definition. It was an offense in canon law, and it was also for long an offense according to civil law.

The Theological Sense of the Term.—The early Christian writers say a great deal about *heresy*, but commonly refrain from telling what it is. They describe *heresies*, but they only denounce *heresy*. It is vain to look for a definition of it in Irenæus' *Against Heresies*, in Hippolytus' *Refutation of all Heresies*, in Tertullian's *Prescription against Heretics*. It is possible, indeed, to collect from these one or two leading tests of *heresy*, but no definition is to be found. The common features of *heresy* are too well known to call for specific enumeration. We can gather from Irenæus that heretics are those who reject Scripture, who refuse to accept the "doctrina tradita," who deny the authority of the clergy who have come in regular succession from the apostles, who keep aloof from the Catholic Church, the sole depository of apostolic doctrine. Tertullian, in his usual succinct manner, calls every man a heretic who does not at once accept the "Regula Fidei," and he refuses to argue with such a man even though the heretic proceeds to adduce arguments from Scripture. In the Eastern Church, after the period of the oecumenical councils, Tertullian's test was the touchstone of *heresy*. The church had her rule of faith expanded into the Nicæo-Constantinopolitan creed, with the various explanations added in the symbols of the remaining oecumenical councils, and a heretic was one who denied this creed in whole or in part. In the Western Church, on the other hand, theologians were accustomed to define *heresy* in a vague way. Thus Jerome calls *heresy* "perversum dogma;" a heretic, with him, is one who interprets Scripture in other fashion than according to the witness of the Spirit of God; and Augustine summarily defines *heresy* to be the invention or retention of new and false opinions. But whatever the definition, the rough and ready test was always nonconformity to the "formula fidei præscripta ab ecclesia Romana." Instead of

definition the Eastern Church simply points to the creed and the œcumenical councils; the Western Church to the rule of faith enjoined by Rome.

HERFORD, a town of Prussia, capital of a circle in the government district of Minden, province of Westphalia; is situated in a beautiful and fruitful district at the confluence of the Werra and Aa, and on the Minden and Cologne railway, nineteen miles southwest of Minden. Population, 12,000.

HERIOT. See COPYHOLD.

HERIOT, GEORGE (1563-1623), the founder of Heriot's Hospital, Edinburgh, was descended from an old family of some consideration in the county of Haddington; and his father, a goldsmith in Edinburgh, for some time represented the city in the Scottish parliament. In 1601 he became jeweler to the king, and on the removal of the court to London, he followed his royal master thither, and occupied a shop opposite the Exchange. Heriot was largely indebted for his fortune to the extravagance of the queen, and to the imitation of this extravagance by the nobility. The surplus of his estate, after deducting legacies to his nearest relations and some of his more intimate friends, was bequeathed to found a hospital for the education of freemen's sons of the town of Edinburgh; and its value afterward increased so greatly as to supply funds for the erection of several Heriot foundation schools in different parts of the city.

HERISAU, the largest town in the Swiss half-canton of Appenzell-ausser-Rhoden, is situated at the confluence of the Glatt and Brühlbach, seven miles northwest of Appenzell, and about 2,550 feet above sea-level. Population, 10,000.

HERISTAL. See HERSTAL.

HERITABLE JURISDICTIONS, in the law of Scotland, were grants of jurisdiction made to a man and his heirs. They were a usual accompaniment to feudal tenures, and the power which they conferred on great families, being recognized as a source of danger to the state, led to frequent attempts being made by statute to restrict them, both before and after the Union. They are now all abolished.

HERLEN, FRITZ, of Nördlingen, was an artist of the early Swabian school, who tempered the rudeness of his native art with some of the delicacies of the masters of Bruges. The date and place of his birth are unknown, but his name is on the roll of the tax-gatherers of Ulm in 1449; and in 1467 he was made citizen and town painter at Nördlingen, where he died October 12, 1491.

HERMANN, the popular modern name in Germany for the ancient German hero Arminius. (See GERMANY).

HERMANN, commonly distinguished as Hermannus Contractus, *i. e.*, Hermann or Heriman the lame, an old German chronicler and scholar, was born in 1013, a son of the Swabian Count Wolverad (Wolfrat) of Vehreningen (Veringen or Voringen), and died in 1054, at the family residence of Aleshusen near Biberach.

HERMANN, FRIEDRICH BENEDICT WILHELM VON (1795-1868), writer on political economy, was born December 5, 1795, at Dinkelsbühl in Bavaria, and died in 1868.

HERMANN, JOHANN GOTTFRIED JAKOB, classical editor and philologist, was born at Leipsic on November 28, 1772. Entering the university of his native city at the age of fourteen, Hermann at first studied law, but his inclination to classical learning was too strong to be resisted, and accordingly, after a session spent at Jena, in 1793-94, he became a lecturer on classical literature in Leipsic. In 1798 he was appointed professor extraordinarius of philosophy at the university there, and after refusing an invitation to proceed to Kiel as rector of

a school, he was, in 1803, chosen professor of eloquence. In 1809 he received the chair of poetry in addition. He died, senior of the university, on December 31, 1848.

HERMANN, KARL FRIEDRICH, one of the leading representatives of classical investigation in Germany, was born August 4, 1804, at Frankfort-on-the-Main. His early education was received partly at Frankfort and partly at Weilburg, and his university studies were carried on at Heidelberg and Leipsic. On his return from a tour in Italy he habilitated in 1826 as privat-docent in Heidelberg; in 1832 he was called to Marburg as professor ordinarius of classical literature; and in 1842 he was transferred to Göttingen to fill the chair left vacant by the death of Otfried Müller. Both at Marburg and Göttingen he likewise held the office of director of the philological seminary. He died at Göttingen on January 8, 1856.

HERMANNSTADT, chief town of an Hungarian county of the same name, is situated on the Szeben, an affluent of the Aluta, about seventy-two miles southeast of Kolozsvár (Klausenburg), and is the terminus of the Kapus and Nagy-Szeben branch line of railway. Population about 20,000.

HERMAS. See APOSTOLIC FATHERS.

HERMENEUTICS, BIBLICAL, is that branch of theological science which treats of the principles of Scripture interpretation. Various described as the theory of the discovery and communication of the thoughts of Holy Scripture, the science of obtaining clearness both in comprehending and in explaining the sense of the Biblical authors, the methodological preparation for the interpreter and for exegesis, the science of the removal of differences between us and the sacred writers, it has for its task to determine the laws of valid exegetical practice.

HERMES is the name of a Greek god (corresponding to the Roman Mercury), whose origin and real character are perhaps more difficult to define than is the case with any other Greek deity. He was not a god worshiped by the pure Doric or Ionic races, but is found in most places where Æolian, Achæan and Pelasgic tribes can be traced. If we begin with the rudest races, summed up generally under the title of Pelasgic, we find Hermes often connected with the mysterious Cabiri. These deities, in the accounts we have, vary in number and sex, being sometimes two, sometimes three or four. We may conclude that originally they were a pair, male and female, whom we may compare with Uranus and Gæa, or with Cronus and Rhea. Often the female is doubled, as mother and daughter, resembling the relation of Demeter and Persephone; while the male also is transformed, either into twin brothers or into a father and his son, by one of the female deities. Certainly the male deity seems sometimes to be regarded as Hermes, sometimes as Hephæstus (see HEPHÆSTUS), while in other places the two are associated. Hermes and Hephæstus are perhaps local varieties of one type, which, after having acquired distinct individuality in their separate homes, were brought beside each other by subsequent intercourse. Hence we may understand how the epithet *ἄγγελος* and the office of messenger between gods and men, which in the *Rig Veda* belong to Agni, the fire, are in Greek mythology attached to Hermes. This Pelasgic Hermes is an ithyphallic deity, the god of fertility and reproductive power, and bestower of riches in flocks and herds. In the very mixed Attic people it is not surprising to find the worship of Hermes widespread; it is sometimes said to have been introduced from Samothrace. In Athens, Hermes is the god of social life and intercourse in general, of streets and doorways, and of the palestra. As god of social intercourse he easily grows into the imper

sonification of cleverness, and at last into the patron of thieves.

In art, besides the *Hermæ* already described, *Hermes* is in the archaic time represented as a man with pointed beard, wearing a chlamys and the broad hat called *petasus*; his symbols are the staff and the winged shoes. The ideal type of *Hermes* was probably modeled after the statue by *Praxiteles* in the *Heraion* at *Olympia*.

HERMES, GEORG, a distinguished Catholic theologian, born April 22, 1775, at Dreyerwald, in Westphalia, was educated at the gymnasium and university of Münster. After completing his course of study at Münster, he acted for some time as lecturer at the gymnasium and then as professor at the university. In 1820 he was called, as professor of theology, to the university of Bonn, where he remained till his death on May 26, 1831. *Hermes* was peculiarly adapted for the life and work of the professoriate. He had great gifts as a lecturer and teacher, and gathered round him at Bonn a devoted band of adherents.

HERMES TRIMEGISTUS. The Egyptian *Thoth*, *Taut*, or *Tat*, who was identified by the Greeks more or less completely with their own *Hermes*, is described in the hieroglyphics by various epithets, among which occurs that of "the great great" or twice great, with an added hieroglyphic (a kite) also signifying "great." To him as scribe of the gods, "Lord of the divine words," "Scribe of truth," was attributed the authorship of all the strictly sacred books generally called by Greek authors *Hermetic*. These, according to *Clemens Alexandrinus*, our sole ancient authority, were forty-two in number, and were subdivided into six divisions, of which the first, containing the ten books "of the prophets," dealt with laws, deities, and the education of priests; the second, consisting of the ten books of the "stolistes," or official whose duty it was to dress and ornament the statues of the gods, treated of sacrifices and offerings, prayers, hymns, festive processions; the third, "of the hierogrammatist," also in ten books, was a repertory of hieroglyphical, cosmographical, geographical, and topographical information; the four books "of the horoscopus" were devoted to astronomy and astrology; the two books "of the chanter" contained respectively a collection of songs in honor of the gods and a description of the royal life and its duties; while the sixth and last division, consisting of the six books "of the pastophor," was medical. Of this canon, which, according to the generally received opinion of *Bunsen*, must have been closed, at latest, in the time of the *Psammetichi*, but probably earlier, numerous small fragments are to be found in the works of *Stobæus* and other ancient writers. The now well-known *Book of the Dead*, according to *Bunsen*, originally had its place among the ten ceremonial books of the "stolistes," but this is denied by *Lepsius*; an ancient papyrus recently deciphered by *Ebers* is believed by that author to date from about the year 1500 B.C., and to have formed part of one of the books of the pastophor.

HERMESIANAX, an elegiac poet of the Alexandrian school, was born at Colophon, and flourished in the time of *Philip* and *Alexander*, or a little later.

HERMIGENES, or *Tarsus*, Greek rhetorician, flourished in the reign of *Marcus Aurelius*. His precocious ability secured him a public appointment as teacher of his art while as yet he was only a boy; but at the age of twenty-five his faculties gave way, and he spent the long remainder of his life in a state of intellectual imbecility. In the nine or ten years, however, of his activity he composed a whole series of treatises on matters rhetorical, which became popular books, and the subject of subsequent commentaries

HERMON, the highest mountain in Syria (9,150 feet above the Mediterranean), an outlier of the *Antilebanon*. The *Sidonians* called it *Sirion*, and the *Amorites* *Shenir*. It is probably the "high mountain" near *Caesarea Philippi* where the *Transfiguration* occurred (Mark ix. 2). The modern name is *Jebel esh Sheikh*, or "chief mountain." It is also called *Jebel eth Theli*, "snowy mountain."

HERMOSILLO, a town of Mexico, state of *Sonora*, is situated at the entrance to a valley of remarkable fertility, near the river *Sonora*, at its confluence with the *Horcasitas*, forty miles southwest of *Ures*. Some of the principal houses are built of stone, but most of the dwellings are of adobe. The town possesses two churches, a prison, and a mint. Its rise and early prosperity were due to the discovery of gold mines in *Sonora*, but it now depends wholly on the fertility of the surrounding country, of which the principal products are cotton, wheat, grapes, and a variety of fruits. The town is the commercial center of *Sonora*. It has cotton manufactories, flour mills, and brandy distilleries, and carries on a considerable foreign trade by means of the port of *Guaymas*, which is 100 miles distant. The population is about 20,000.

HERMSDORF, generally known as *Niederhermsdorf*, a town of Prussia, in the government district of *Breslau* and circle of *Waldenburg*. Population, 6,000.

HERMUPOLIS, a town in Greece pop. (1898), 17,894.

HERNIA is the protrusion of any viscus from its normal cavity. The word may here be restricted to its most usual meaning, a protrusion of part of the contents of the abdomen from their normal position in the abdominal cavity—in common language, a "rupture." A rupture may occur at any weak point in the abdominal wall. The common situations are the groin (inguinal hernia), the upper part of the thigh (femoral hernia), and the umbilicus or navel (umbilical hernia). The contents of a rupture may be any of the abdominal viscera; the more movable the viscus the more tendency there is to protrusion, and, therefore, we generally find that the small intestine and the omentum are most frequently displaced. Rupture is either congenital or acquired. A child may be born with a hernia in the inguinal or umbilical region, the result of an arrest of development in these parts; or the rupture may be acquired, first appearing, perhaps, in adult life. Ruptures are most frequent at the extremes of life. Men suffer more frequently than women, because they are more liable to accidents, being frequently exposed to intermittent work, such as the lifting of heavy weights.

At first the rupture is small, and with more or less rapidity it gradually increases in size; it varies from the size of a small marble to that of a child's head, or even larger. There are three distinct conditions in which we may find the contents of a hernial tumor; it may be either reducible, irreducible, or strangulated. A "reducible" hernia is one in which the contents can be pushed back into the abdomen. In some cases this is done with ease; in others it is a matter of great difficulty. At any moment a reducible hernia may become "irreducible," that is to say, its contents cannot be pushed back into the abdominal cavity. This may suddenly occur in consequence of an attack of constipation, or slowly, the irreducibility being at first partial and gradually becoming more and more complete. Generally, this is due to an increase in the size of the omentum, accompanied by inflammatory induration. A "strangulated" hernia is one in which the circulation of the blood through the hernial contents is interfered with. The interference is at first slight, but very rapidly tends to become more pronounced. At first there is congestion; this congestion may go on to inflammation;

if unrelieved, the inflammation will end in mortification. The rapidity with which the change from simple congestion to mortification takes place will depend on the tightness of the constricting cause; as a rule, the more rapidly a hernia forms, in other words, the less time the surrounding tissues have to accommodate themselves to the protruding swelling, the greater the rapidity of the changes in the conditions of the contents. The constricting agent may be one or other of the structures which form the boundaries of the openings through which the hernia has traveled in its gradual course through the abdominal wall, or it may lie in the neck of the sac, which has become thickened in consequence of inflammation.

Reducible Hernia.—The symptoms of reducible hernia show themselves in a soft compressible tumor (elastic when it contains intestine, doughy when it contains omentum, a combination of elasticity and doughiness when both are present), its size increasing in the erect, and diminishing in the horizontal posture, whence as a rule it gives little trouble during the night, and becomes more troublesome in the daytime, more especially toward evening. There is a more or less distinct impulse on coughing, and when the intestinal contents are pushed back into the abdomen a gurgling sensation is perceptible by the fingers.

The treatment of reducible hernia consists in pushing back the contents of the tumor into the abdomen, and applying a truss or elastic bandage in order to prevent the contents from again escaping. The younger the patient the more chance there is of the truss acting as a curative agent, as the natural tendency to contraction of the channel through which the hernia protrudes is greater. The truss is frequently laid aside at night, because in the horizontal posture the tendency of the contents to descend is greatly lessened. The truss or bandage should, however, be worn day and night. If, after the hernia is once returned, it is never again allowed to come down, there is a probability of a cure taking place; but if it is allowed to come down occasionally, as it may do, even during the night, in consequence of a cough or from turning suddenly in bed, the parts are stretched, and the contracting process which may have been going on for weeks is undone.

A truss should fit accurately, the necessary amount of pressure being obtained by means of a steel spring, to which a pad is attached. The pad should be so arranged as to press, not into the opening through which the hernia has come, but rather on its side, so as to facilitate its contraction and permanent closure. The main pressure should be in the neighborhood of the neck of the sac; if the pad presses into the opening, the tendency is to keep the opening patent. The principle of the nipple-shaped pad, frequently ordered for umbilical hernia, is evil; a flat pad properly applied and held in position by an elastic bandage is the proper arrangement for restraining an umbilical hernia. No truss is to be applied until the hernia is completely reduced; it will only do harm by pressing on the contents of the unreduced hernia. In some hernia, generally those of large size, it is found impossible to keep them up by means of a truss; in such cases an elastic bandage will sometimes effect the object, in others various operations have been recommended. They are spoken of as "the radical cure of hernia," in contradistinction to the so-called "palliative treatment by means of a truss," and are too purely the work of the accomplished surgeon to be described here.

Irreducible Hernia.—Here the main symptom is a tumor of long standing and generally of large size, in which the contents of the tumor, in whole or in part, cannot be pushed back into the abdomen. The irre-

ducibility is due either to its large size or to changes which have taken place in the contents, either indurations or adhesions. Such a tumor is a constant source of danger; its contents are liable, from their exposed situation, to injury from external violence; it has a constant tendency to increase in size; it may at any time become strangulated, or the contents may inflame, and strangulation may occur secondarily to the inflammation. It is accompanied by dragging sensations referred to the abdomen, colic, dyspepsia, and constipation, which may in its turn lead to obstruction, that is to say, a stoppage of the passage of the contents of that portion of the intestinal canal which lies in the hernial tumor. When an irreducible hernia becomes painful and tender, a local peritonitis has occurred, which resembles in many of its symptoms a case of strangulation.

The treatment of irreducible hernia may be palliative; a bag truss may be worn to prevent the swelling from getting larger; the bowels must be kept open, and all irregularities of diet avoided. A person with such a hernia is in constant danger, and more than palliation is called for. An attempt should be made to reduce the hernia—by laying the patient on his back, raising his buttocks, administering purgatives, and starving him (persevering attention to these points may so reduce the size of the contents that the hernia may be returned); or by means of an elastic bandage carefully applied so as to press continuously on the tumor, and gradually press it back into the abdominal cavity. By this simple means large irreducible herniæ, which have withstood all attempts at reduction, have been returned into the abdomen after elastic pressure has been carefully and continuously applied for a few days. If these measures fail active surgical interference must at once be invoked.

Strangulated Hernia.—In this the contents are constricted, and the flow of blood into the tumor and from the tumor is stopped. The symptoms are—nausea, vomiting first of bilious matter, after a time of fecal matter, a twisting, burning pain generally referred to the umbilicus, intestinal obstruction, a quick, wiry pulse, pain on pressure over the tumor and in the abdomen near the tumor, the abdomen tense and tympanitic, and no impulse on coughing, because the contents of the tumor are practically cut off from the general abdominal contents. The patient has an anxious expression. Sooner or later, from eight hours to eight days, if the strangulation is unrelieved, the tumor will become livid and emphysematous; mortification has occurred, and gangrene of the bowel at the neck of the sac will take place, followed by extravasation of the intestinal contents into the abdominal cavity; the patient becomes collapsed, and dies comatose.

The treatment of a strangulated hernia admits of no delay; delay is fatal. A surgeon should be at once employed. Anyone suffering from hernia should take great care to obtain an accurately fitting truss, and should remember that, whenever any symptoms resembling in any degree those of strangulation occur, any delay in the treatment is not only dangerous but may prove fatal. A medical man should at once be communicated with. If an operation is necessary, the operation is not in itself a dangerous one, while, on the other hand, any delay is most certainly excessively dangerous.

HERNÖSAND, chief town and seat of the administration of the län of Wester Norrland on the east coast of Sweden, is built on the island of Hernö (connected with the mainland by bridges), about three miles south of the mouth of the Angerman river, and 230 miles north of Stockholm. Population about 6,000.

HERO AND LEANDER. Hero, the beautiful priestess of Venus at Sestos, was there seen by Leander, a youth of Abydos, at the celebration of the festival of

Venus and Adonis. He became deeply enamored of her, and found that day an opportunity of declaring his passion, which she returned; and as her position rendered their marriage impossible, they agreed to carry on a clandestine intercourse. Nightly Herod placed a lamp in the top of the tower where she dwelt by the sea, and Leander, guided by it, swam the dangerous Hellespont. One stormy night the lamp was blown out, and Leander perished. On finding his body next morning on the shore, Herod flung himself into the waves.

HEROD was the name of a family of Idumean origin, which displaced the Asmoneans as the rulers of Judaea. The founder of the dynasty, and its most notable representative in every way, was Herod the Great, who was king of the Jews for about thirty-seven years, from 40 to 4 B.C. Herod's father was Antipater, who during the troubles which broke out in the family of Alexander Jannæus, attached himself to Hyrcanus, the weak-minded son of Alexander. In this way Antipater, though an Idumean, soon became the most powerful man in Judaea, and in the Alexandrian war gave such effectual help to Julius Cæsar that the dictator made him procurator of Judaea, Hyrcanus being high priest, (47 B.C.) The same year, at the age of twenty-five, Herod was appointed governor of Galilee by his father. He soon gave proof of the remarkable energy of his character in rooting out the banditti who infested his province; but his summary measures gave a handle to the enemies of his house at Jerusalem, and he was summoned before the sanhedrin. There he appeared, not in the garb of an accused person, but gorgeously attired, and attended by a guard of soldiers. He found it expedient, however, to withdraw from Jerusalem without awaiting the sentence. He retired to Syria, where he met with a gracious reception from Sextus Cæsar, who appointed him governor of Cæle-Syria. Herod now marched with an army against Jerusalem, but at the persuasion of his father and brother was induced to depart without exacting vengeance on his enemies. After the death of Cæsar, the fortunes of Herod were affected by all the changes which befell the Roman state. When Cassius took the command in the East, and began to gather his strength for the final struggle which was decided at Philippi, Herod managed to win his favor by the readiness with which he raised his share of the heavy exactions imposed upon the East. About the same time his father was poisoned, and to Herod fell the task of avenging his death, as well as of supporting the interests of his house in Palestine. After Philippi he gained Antony over by large presents of money. He and his brother Phasael were appointed tetrarchs of Judaea. In 40 B.C. the Parthians appeared upon the scene, overran the whole of Syria, and placed on the throne of Judaea Antigonus, son of Aristobulus, and representative of the rival branch of the Asmonean house. Herod was completely overpowered; and, after placing his relatives in safety, so far as he could, he hastened to Rome to lay his case before Antony and Octavianus. He succeeded beyond his expectations, for, while he meant only to advocate the claims of Hyrcanus the Asmonean, the two heads of the state made him king of Judaea. Herod returned home without delay, and set about the task of winning the kingdom allotted to him. Owing chiefly to the slackness of the Roman generals who should have helped him, it was three years before he succeeded in taking Jerusalem, (37 B.C.) Before that event he had married the beautiful Mariamne. Herod's early measures were cruel; he put to death all the members of the sanhedrin except two, and spared no one that was likely to stand in his way. Aristobulus, the youthful brother of Mariamne, whom he had appointed high

priest, he caused to be treacherously drowned because he was too popular with the patriotic party. On this occasion Alexandra, mother of Aristobulus, induced Cleopatra to take her part, and Herod had to appear before Antony to answer the charge of murdering the prince. Again Herod knew how to gain the Roman, and he returned home with confirmed power. During the war of Actium, Herod had the good fortune to be engaged in a war with the King of Arabia on Antony's behalf, and so escaped the risk of fighting against Octavianus. Hastening to Rhodes (30 B.C.), he appeared in the presence of the conqueror, and avowing his loyalty to his friend Antony, proffered the same faithful service to Octavianus. Octavianus was gracious, and remained the constant friend and patron of Herod to the end. This was the last crisis of Herod's life; he was henceforward undisputed king of Judaea, and next to Agrippa the most trusted friend of Augustus. But while the friend of the great and prosperous in all external relations, Nemesis pursued him in his family. When summoned to answer for himself before Antony, and again on his journey to Rhodes, he left the beautiful and beloved Mariamne in charge of one of his friends, but with the cruel injunction that she should be put to death should any thing serious befall himself. On both occasions Mariamne discovered the secret, and, instead of regarding the command as a proof of his jealous love, abhorred it as another instance of the cruelty which had not spared so many of her nearest relatives. A horrible tragedy ensued: Mariamne openly expressed her disgust; and Herod, furious with rage, jealousy, and rejected love, ordered her death. The violence of his feelings threw him into a dangerous malady, and even drove him to the verge of insanity. His turbulent subjects were kept tolerably quiet in spite of heavy taxes. He managed to gratify his love for Greek and Roman life; and yet he avoided wounding too deeply the susceptibilities of the Jews. The magnificent buildings which he raised were the most brilliant products of his reign. He rebuilt Samaria, calling it Sebaste, from the Greek name for Augustus. He converted the small town of Strato's Tower into a magnificent seaport with an artificial harbor, under the name of Cæsarea. These and other towns which he built were furnished with temples, theaters, aqueducts, and all the other ornamental and useful appliances of Greek and Roman life. In the city of Jerusalem even he built a theater, and an amphitheater outside of it. A more patriotic work was the rebuilding of the temple (begun 20 B.C.), which had suffered greatly during the late troubles; it was on a very magnificent scale, and lasted nine years and a half, even then being unfinished. The last years of Herod's life were darkened by the return of those family troubles which had previously overcast it. His two sons by Mariamne had been educated at Rome, and returned, 17 B.C., to Judaea. Their father himself was proud of them. But Pheroras and Salome, brother and sister of Herod, did all they could to sow jealousy and suspicion. Herod's mind was too painfully open to dark insinuations, and he recalled his eldest son Antipater to counterbalance the influence of the Asmonean princes. After the arrival of Antipater, who was a most unscrupulous plotter, there was no more peace or security at the court of Herod; things went from bad to worse, till after many years of the darkest intrigue and the bitterest domestic contention, the two sons of Mariamne were strangled at Sebaste. Soon after the clearest proof was discovered of a conspiracy which Antipater had formed with Pheroras against the life of Herod himself. The order for the death of Antipater was given by Herod from his death-bed. His health had long been

ailing; after the cruellest torments of both mind and body, he died 4 B.C. The birth of Christ took place in the same year as Herod's death, but this, as is well known, occurred four years before the date fixed as the beginning of the Christian era. The massacre of the little children at Bethlehem is not mentioned by Josephus among the horrors of Herod's last days. He was buried with great magnificence. His will, by which the greater part of his dominions was bequeathed to his sons by Malthace, a Samaritan, was confirmed by Augustus.

HEROD ANTIPAS, son of Herod the Great, by the Samaritan Malthace, and brother of Archelaus, received as his share of his father's dominions the provinces of Galilee and Perea. Like his father, Antipas had a turn for architecture: he rebuilt and fortified the town of Sepphoris; he also fortified Betharamphtha, and called it Julius, after the wife of the emperor. Above all he founded the important town of Tiberias, on the west shore of the Sea of Galilee, with institutions of a distinctly Greek character. Antipas is mentioned more than once in gospel history under the name of Herod. He it was who was called a "fox" by Christ. He is erroneously spoken of as a king in Mark vi. 14. It was to him that Jesus was sent by Pilate to be tried. But it is in connection with his wife, Herodias, that he is best known, and it was through her that his misfortunes arose. He was married first of all to a daughter of Aretas, the Arabian king; but, making the acquaintance of Herodias, the wife of his brother Philip (not the tetrarch), during a visit to Rome, he was fascinated by her, and arranged to marry her. Meantime his Arabian wife discovered the plan and escaped to her father, who made war on Herod, and completely defeated his army. John the Baptist condemned his marriage with Herodias, and, in consequence, was put to death in the way described in the gospels and in Josephus. When Herodias' brother, Agrippa, was appointed king by Caligula, she was determined to see her husband attain to an equal eminence, and persuaded him, though naturally of a quiet and unambitious temperament, to make the journey to Rome to crave a crown from the emperor. Agrippa, however, managed to influence Caligula against him. Antipas was deprived of his dominions, and banished to Lyons, Herodias voluntarily sharing his exile.

HEROD PHILIP, son of Herod the Great, by Cleopatra of Jerusalem, received the tetrarchate of Ituræa, and other districts to the northeast of the Jordan. He is a different person from the first husband of Herodias, also called Philip by St. Mark (vi. 17), and was married to Salome, the daughter of Herodias. Philip is described as an excellent ruler, who loved peace, and was careful to maintain justice, and spent his time in his own territories. He was also a builder of cities, one of which was Cæsarea Philippi, and another was Bethsaida, which he called Julius. He died after a reign of thirty-seven years; and his dominions were incorporated in the province of Syria.

HERODIANS, a sect or party mentioned in Scripture as having on two occasions — once in Galilee, and again in Jerusalem — manifested an unfriendly disposition toward Jesus. In each of these cases their name is coupled with that of the Pharisees. According to many interpreters the courtiers or soldiers of Herod Antipas are intended; but more probably the Herodians were a public political party, who distinguished themselves from the two great historical parties of post-exilian Judaism by the fact that they were and had been sincerely friendly to Herod the Great and to his dynasty.

HERODIANUS, the author of a Greek history of the period extending from 180 to 238 A.D. Of his

origin and condition in life very little is known. He was in Rome in 203, and seems to have held some public office. It has been conjectured that he was first "procurator Cæsaris" and afterward "legatus" of the Sicilian provinces, and that, while fulfilling his official duties, he wrote at intervals the history which bears his name. The narrative is of special value for the reigns of the emperors subsequent to Alexander Severus, with whom the work of Dion Cassius ends.

HERODIANUS, ÆLIUS, a famous grammarian of antiquity, called by Priscian "maximus auctor artis grammaticæ." He was the son of the grammarian Apollonius, was born at Alexandria, and resided at Rome. He was patronized by the emperor Marcus Aurelius (161–180 A.D.), to whom he dedicated his great treatise on prosody. This was a work in twenty books, which included also an account of the etymological part of grammar. An epitome of it has been preserved.

HERODOTUS, according to the best authorities, was born in or about the year 484 B.C. He was a native of Halicarnassus, a city which belonged originally to the Doric Hexapolis, situated toward the southwestern corner of Asia Minor, but which from a date considerably anterior to the birth of Herodotus had been excluded from the confederacy, and was an isolated Greek town, dependent upon the Persians. Herodotus was thus born a Persian subject, and such he continued until he was thirty or thirty-five years of age.

Of the education of Herodotus no more can be said than that it was thoroughly Greek, and embraced no doubt the three subjects essential to a Greek liberal education — grammar, gymnastic training, and music. It is clear from the extant work of Herodotus that he must have devoted himself earlier to the literary life, and commenced that extensive course of reading which renders him one of the most instructive as well as one of the most charming of ancient writers. The poetical literature of Greece was in his time already large; the prose literature was more extensive than is generally supposed; yet Herodotus shows an intimate acquaintance with the whole of it. He has drunk at the Homeric cistern till his entire being is impregnated with the influence thence derived. The *Iliad* and the *Odyssey* are as familiar to him as Shakespeare to the most highly educated of modern Englishmen. He is acquainted with the poems of the epic cycle, the *Cypria*, the *Epigoni*, etc. He quotes or otherwise shows familiarity with the writings of Hesiod, Olen, Museus, Bacis, Lysistratus, Archilochus of Paros, Alcæus, Sappho, Solon, Æsop, Aristæus of Proconnesus, Simonides of Ceos, Phrynichus, Æschylus, and Pindar. He quotes and criticises Hecateus, the best of the prose writers who had preceded him, and makes numerous allusions to other authors of the same class. It may be questioned whether there was any single work of importance in the whole range of extant Greek literature with the contents of which Herodotus had not made himself acquainted by the time that he undertook the composition of his "History."

It must not, however, be supposed that the great Halicarnassian was at any time a mere recluse student. There can be no reasonable doubt that from a very early age his inquiring disposition led him to engage in travels, both in Greece and in foreign countries, which must have been continued year after year for a considerable period, and which made him as familiar with men as with books. He traversed Asia Minor and European Greece in all directions, probably more than once; he visited all the most important islands of the Archipelago — Rhodes, Cyprus, Delos, Paros, Thasos, Samothrace, Crete, Samos, Cythera, and Ægina. He undertook the

long and perilous journey from Sardis to the Persian capital Susa, passed some considerable time at Babylon, and went a voyage to Colchis, and another along the western shores of the Black Sea as far as the estuary of the Dnieper; he traveled in Scythia and in Thrace, visited Zante and Magna Græcia, explored the antiquities of Tyre, coasted along the shores of Palestine, saw Gaza, and made a long stay in Egypt. At the most moderate estimate, his travels covered a space of thirty-one degrees of longitude, or 1,700 miles, and twenty-four of latitude, or nearly the same distance. Nor was he content, like the modern tourist, with hasty glimpses of the countries which he visited. At all the more interesting sites he took up his abode for a time; he examined, he inquired, he made measurements, he accumulated materials. Having in his mind the scheme of his great work, he gave ample time to the elaboration of all its parts, and took care to obtain by personal observation a full knowledge of all the various countries which were to form the scene of his narrative.

The travels of Herodotus seem to have been chiefly accomplished between his twentieth and his thirty-seventh year, (464-447 B.C.) It was probably in his early manhood that as a Persian subject he visited Susa and Babylon, taking advantage of the Persian system of posts which he describes in his fifth book. His residence in Egypt must, on the other hand, have been subsequent to 460 B.C., since he saw the skulls of the Persians slain by Inarus in that year. On his return from Egypt, as he proceeded along the Syrian shore, he seems to have landed at Tyre, and thence to have gone to Thasos, which lay off the coast of Thrace. His Scythian travels are thought to have taken place prior to 450 B.C. We are told that when he quitted Halicarnassus on account of the tyranny of Lygdamis, in or about the year 457 B.C., he took up his abode in Samos. That island was an important member of the Athenian confederacy, and in making it his home Herodotus would have put himself under the protection of Athens. The fact that Egypt was then largely under Athenian influence may have induced him to proceed, in 457 or 456 B.C., to that country. The complete knowledge that he has of the whole of Egypt indicates a stay there of some years, and it was perhaps not till 454 B.C. that he returned to his Samian home. The stories that he had heard in Egypt of Sesostris may then have stimulated him to make voyages from Samos to Colchis, Scythia, and Thrace. When he had seen these countries, he had made acquaintance with almost all the regions which were to be the scene of his projected history, and could apply himself to the task of its composition with the comfortable feeling that he possessed all the local knowledge requisite for graphic and telling description.

After Herodotus had resided for some seven or eight years in Samos, events occurred in his native city which induced him to return thither. There is reason to believe that his first attempts to push himself into notice were not received with much favor—the prophet did not obtain much honor in his own country—his countrymen ridiculed the work which they had been expected to admire; and the disappointed author, chagrined at his failure, precipitately withdrew from his native town, and sought a refuge in Greece proper, (about 447 B.C.)

A writer of late date (125-200 A.D.) and low credit, Lucian of Samosata, in one of his rhetorical pieces, declares that on quitting Halicarnassus Herodotus proceeded straight to Olympia, and finding the quadrennial festival in progress recited his work to the assembled multitudes, who were highly delighted with it, and freely expressed their admiration. The statement, however, is improbable, and is rejected by most critics.

From earlier and better writers we learn that Athens was the place to which the disappointed author betook himself, and that he appealed from the verdict of his countrymen to Athenian taste and judgment. By recitations held in that city he made his work known to the best Grecian intellects, and won such approval that in the year 445 B.C., on the proposition of a certain Anytus, he was voted a sum of ten talents by decree of the people. At one of the recitations Thucydides was present with his father, Olorus, and was so moved that he burst into tears, whereupon Herodotus remarked to the father—"Olorus, your son has a natural enthusiasm for letters."

Athens was at this time the center of intellectual life, and could boast a galaxy of talent such as has rarely been gathered together either before or since. The stately Pericles, his clever rival Thucydides the son of Melesias, the fascinating Aspasia, the eloquent Antiphon, the scientific musician Damon, the divine Phidias, Protagoras the subtle disputant, Zeno the inventor of logic, the jovial yet bitter Cratinus, the gay Crates, Euripides the master of pathos, Sophocles the most classic even of the ancients, formed a combination of which even Athens might be proud, and which must have charmed the literary aspirant. Accepted into this brilliant society, on familiar terms with all probably, as he certainly was with Olorus, Thucydides, and Sophocles, he cannot but have found his Attic sojourn delightful, and have been tempted, like many another foreigner, to make Athens his permanent home. In the year 444 B.C., on the scheme of sending a colony to Thurii in Italy being broached by Pericles, Herodotus was among those who gave in their names; and in the spring of the following year he sailed from Athens to Italy with the other colonists, and became a citizen of the new town.

From this point of his career, when he had reached the age of forty, we lose sight of Herodotus almost wholly. He seems to have made but few journeys, one to Crotona, one to Metapontum, and one to Athens (about 430 B.C.) being all that his work indicates. No doubt he was employed mainly, as Pliny testifies, in retouching and elaborating his general history. He may also have composed at Thurii that special work on the history of Assyria to which he twice refers in his first book, and which is quoted by Aristotle. It has been supposed by many that he lived to a great age, but the indications derived from the later touches added to his work, which form the sole evidence on the subject, would rather lead to the conclusion that his life was not very prolonged. There is nothing in the nine books which may not have been written as early as 430 B.C.; there is no touch which, even probably, points to a later date than 424 B.C. As the author was evidently engaged in polishing up his work to the last, and even promises touches which he does not give, we may assume that he did not much outlive the date last mentioned, or in other words, that he died at about the age of sixty. The predominant voice of antiquity tells us that he died at Thurii, where his tomb was shown in later ages.

HÉROLD, LOUIS JOSEPH FERDINAND, French musician, was born in Paris, January 28, 1791, the son of François Joseph Hérold, an accomplished pianist. It was not till after his father's death that Hérold in 1806 entered the Paris conservatoire, where he studied under Catel and Méhul, one of the leading composers of the time, by whose teaching his pupil profited soon and permanently. In 1812 he gained the grand prix de Rome (a traveling scholarship awarded by the French Government to the best pupils of the conservatoire), and accordingly started for Italy, where he remained till 1815, and composed a symphony, a cantata, and several pieces of chamber music. It was also during his

stay in Italy that Hérold for the first time ventured on the stage with the opera *La Gioventù di Enrico V.*, first performed at Naples in 1815 with moderate success. Returning to Paris he had the good fortune to be invited by Boieldieu to participate in the composition of an opera called *Charles de France*, performed in 1816, and soon followed by Hérold's first French opera, *Les Rosières* (1817), which was received very favorably. Of the numerous dramatic works which Hérold produced for the next fifteen years in rapid succession it is unnecessary to give a detailed account. Only the names of some of the more important may be mentioned here: *La Clochette* (1817), *L'Auteur mort et vivant* (1820), *Marie* (1826), and the ballets *La Fille mal Gardée* (1828), and *La Belle au bois dormant* (1829). In 1831 he produced one of the two works which have given immortality to his name, the romantic opera *Zampa*, which has met with immense success not only in France but also in Germany, where it has kept the stage till the present day, and is considered Hérold's masterpiece. In France that eminence is justly accorded to the *Le Pré aux Clercs* (first performance December 15, 1832), in every way a representative work of the French school, in which French *esprit* and French chivalry find their most perfect embodiment. Hérold died January 19, 1833.

HERON, or HERO, a mathematician and natural philosopher of Alexandria, was the pupil of Ctesibius, and flourished probably about a century or a century and a half before Christ. His name has been preserved in the well-known experiment of Hero's fountain, in which, by means of condensed air, water is made to spring from a jet in a continuous stream.

HERON, called the younger, to distinguish him from his namesake of Alexandria, was, like him, a mathematician and natural philosopher. By some he is supposed to have flourished in the first half of the seventh century A.D.; by others, with more probability, to have lived at Constantinople in the tenth century. He wrote a treatise on *Besieging Engines* which still exists, and another on the *Construction of Sun-dials*, which is now lost.

HERON, a long-necked, long-winged, and long-legged bird, the representative of a very natural group, the *Ardeide*, which through the neglect or ignorance of ornithologists has been for many years encumbered by a considerable number of alien forms, belonging truly to the Cranes, *Gruide* and Storks, *Ciconiide*, whose structure and characteristics are wholly distinct, however much external resemblance some of them may possess to the Herons. Eliminating these intruders, it is difficult or even impossible to estimate with any accuracy the number of species of *Ardeide* which exist.

The common Heron of Europe, *Ardea cinerea* of Linnaeus, is universally allowed to be the type of the family. The species inhabits localities throughout the whole of Europe, Africa, and Asia, reaching Japan, many of the islands of the Indian Archipelago, and even Australia. The sites chosen by the Heron for its nest vary greatly. It is generally built in the top of a lofty tree, but not infrequently (and this seems to have been much more usual in former days) near or on the ground among rough vegetation, on an island in a lake, or again on a rocky cliff of the coast. It commonly consists of a huge mass of sticks, often the accumulation of years, lined with twigs, and in it are laid from four to six sea-green eggs. The young are clothed in soft flax-colored down, and remain in the nest for a considerable time, therein differing remarkably from the "pipers" of the Crane, which are able to run almost as soon as they are hatched. The first feathers assumed by young Herons in a general way resemble those of the adult, but the

fine leaden-gray back, the pure white breast, the black throat-streaks, and especially the long pendent plumes, which characterize only the very old birds, and are most beautiful in the cocks, are subsequently acquired. The Heron measures about three feet from the bill to the tail, and the expanse of its wings is sometimes not less than six feet, yet it weighs only between three and four pounds.

Large as is the common Heron of Europe, it is exceeded in size by the Great Blue Heron of America, *Ardea herodias*, which generally resembles it in appearance and habits, and both are smaller than the *A. sumatrana* or *A. typhon* of India and the Malay Archipelago, while the *A. goliath*, of wide distribution in Africa and Asia, is the largest of all. The Purple Heron, *A. purpurea*, as a well-known European species having a great range over the Old World, also deserves mention here.

HEROPHILUS. See ANATOMY.

HERRERA, FERNANDO DE, lyrical poet, born at Seville, Spain, in 1534. Herrera has been celebrated in a sonnet by Cervantes; and his poems were taken as models by the later poet, Lope de Vega. He died at Seville in 1597.

HERRERA, FRANCISCO (1576-1656), surnamed el Viejo (the old), historical and fresco painter, studied under Luis Fernandez in Seville, his native city, where he spent the most of his life. He was a skillful worker in bronze, an accomplishment that led to his being charged with coining base money. From this accusation, whether true or false, he sought sanctuary in the Jesuit college of San Hermenegildo, which he adorned with a fine picture of its patron saint. Philip IV., on his visit to Seville in 1624, having seen this picture, and learned the position of the artist, pardoned him at once, warning him, however, that such powers as his should not be degraded. In 1650 Herrera removed to Madrid, where he lived in great honor till his death in 1656.

HERRERA, FRANCISCO (1622-1685), surnamed el Mozo (the young), historical and fresco painter, son of the subject of the last notice, was also a native of Seville. Unable to endure his father's cruelty, the younger Herrera, seizing what money he could find, fled to Rome. There, instead of devoting himself to the antiquities and the works of the old Italian masters, he gave himself up to the study of architecture and perspective, with the view of becoming a fresco-painter. He did not altogether neglect easel-work, but became renowned for his pictures of still-life, flowers, and fruit, and from his skill in painting fish was called by the Italians *Lo Spagnuolo degli pesci*. In later life he painted portraits with great success. He returned to Seville on his father's death; and in 1660 was appointed subdirector of the new academy there under Murillo. He went to Madrid, and was employed to paint a San Hermenegildo for the barefooted Carmelites, and to decorate in fresco the roof of the choir of San Felipe el Real. The success of this last work procured for him a commission from Philip IV. to paint in fresco the roof of the Atocha church. He chose as his subject for this the Assumption of the Virgin. Soon afterward he was rewarded with the title of painter to the king, and was appointed superintendent of the royal buildings. He died at Madrid in 1685.

HERRERA Y TORDESILLAS, ANTONIO DE, Spanish historian, was born in 1549, at Cuellar, in the province of Segovia in Spain. Philip II. of Spain appointed Herrera first historiographer of the Indies, and one of the historiographers of Castile. Placed thus in the enjoyment of an ample salary, Herrera devoted the rest of his life to the peaceful pursuit of literature, retaining his office till the reign of Philip IV., by whom

he was appointed secretary of state, very shortly before his death, which took place at Madrid on March 29, 1625.

HERRICK, ROBERT, English poet, was born at Cheapside, London, in August, 1591. He seems to have been present at the first performance of *The Alchemist* in 1610, and it was probably about this time that Ben Jonson adopted him as his poetical "son." He entered the university as fellow-commoner of St. John's College, and he remained there until, in 1616, upon taking his degree, he removed to Trinity Hall; in 1620 he became master of arts. From this date until 1629 we entirely lose sight of him; it has been variously conjectured that he spent these nine years preparing for the ministry at Cambridge, or in much looser pursuits in London. In the latter year he was presented to the rural living of Dean Prior, in Devonshire. He entered upon this new career on October 2, 1629, being in his thirty-ninth year. At Dean Prior he resided quietly until 1648, when he was ejected by the Puritans. He was pleased with the rural and semi-pagan customs that survived in the village, and in some of his most charming verses he has immortalized the morris-dances, wakes, and quintains, the Christmas mummers and the Twelfth-Night revelings, that diversified the quiet Dean Prior. Herrick never married, but lived at the vicarage surrounded by a happy family of pets. His first appearance in print was in some verses he contributed to *A Description of the King and Queen of the Fairies*, in 1635. In 1640 a volume of *Wit's Recreations* contained sixty-two small poems afterward acknowledged by Herrick in the *Hesperides*, and one not reprinted until our own day. In 1648 he published his celebrated collection of lyrical poems, entitled *Hesperides, or the Works both Human and Divine of Robert Herrick*, only a few weeks, it would seem, after his ejection from his living by the Puritans. That he was reduced to great poverty in London has been stated, but Doctor Grosart shows this to be very unlikely. In August, 1662, Herrick returned to Dean Prior, supplanting his own supplanter, Dr. John Symes. He died in his eighty-fourth year, and was buried at Dean Prior, October 15, 1674. As a pastoral lyricist Herrick stands first among English poets. His genius is limited in scope, and comparatively unambitious, but in its own field it is unrivaled. His tiny poems—and of the thirteen hundred he has left behind him not one is long—are like jewels of various value, heaped together in a casket. Some are of the purest water, radiant with light and color, some were originally set in false metal that has tarnished, some were rude and repulsive from the first.

HERRING (*Clupea harengus*), a fish belonging to the genus *Clupea*, of which more than sixty different species are known in various parts of the globe. The sprat, pilchard or sardine, and shad are species of the same genus. Of all sea-fishes *Clupea* are the most abundant; for although other genera may comprise a greater variety of species, they are far surpassed by *Clupea* with regard to the number of individuals. The majority of the species of *Clupea* are of greater or less utility to man; it is only a few tropical species that acquire, probably from their food, highly poisonous properties, so as to be dangerous to persons eating them. But no other species equals the Common Herring in importance as an article of food or commerce. It inhabits in incredible numbers the German Ocean, the northern parts of the Atlantic, and the seas north of Asia. The herring inhabiting the corresponding latitudes of the North Pacific is another species, but most closely allied to that of the eastern hemisphere. Formerly it was the general belief that the herring inhabits the open ocean close to the Arctic Circle, and that it migrates at certain seasons toward the

northern coasts of Europe and America. This view has been proved to be erroneous, and we know now that this fish lives throughout the year in the vicinity of the shores, but at a greater depth, and at a greater distance from the coast, than at the time when it approaches land for the purpose of spawning.

Herrings are readily recognized and distinguished from the other species of *Clupea* by having an ovate patch of very small teeth on the vomer (that is, the center of the palate). In the dorsal fin they have from seventeen to twenty rays, and in the anal fin from sixteen to eighteen; there are from fifty-three to fifty-nine scales in the lateral line, and invariably fifty-six vertebrae in the vertebral column. They have a smooth gill-cover, without those radiating ridges of bone which are so conspicuous in the pilchard and other *Clupea*. The sprat cannot be confounded with the herring, as it has no teeth on the vomer, and only forty-seven or forty-eight scales in the lateral line.

Herrings grow very rapidly. The size which they finally attain and their general condition depend chiefly on the abundance of food (which consists of crustaceans and other small marine animals), on the temperature of the water, on the season at which they have been hatched, etc. Their usual size is about twelve inches, but in some particularly suitable localities they grow to a length of fifteen inches, and instances of specimens measuring seventeen inches are on record. In the Baltic, where the water is gradually losing its saline constituents, thus becoming less adapted for the development of marine species, the herring continues to exist in large numbers, but as a dwarfed form, not growing either to the size or to the condition of the North-Sea herring. The herring of the American side of the Atlantic is specially identical with that of Europe. A second species *Clupea leachii* has been supposed to exist on the British coast; but it comprises only individuals of a smaller size, the produce of an early or late spawn. Also the so-called "whitebait" is not a distinct species, but consists chiefly of the fry or the young of herrings, and is obtained in perfection at localities where these small fishes find an abundance of food, as in the estuary of the Thames. The important subject of herring-fishing has already been treated in the article FISHERIES.

HERRNHUT, a town of Saxony, in the circle and eighteen miles southeast of the town of Bautzen, is chiefly known as the principal seat of the Moravian or Bohemian Brotherhood, styled on the Continent Herrnhuter, a colony of whom, fleeing from persecution in their own country, settled at Herrnhut in 1722, on a site presented by Count Zinzendorf.

HIERSCHIEL, CAROLINE LUCRETIA, sister of Sir William Herschel, the eighth child and fifth daughter of her parents, was born at Hanover on March 16, 1750. In the autumn of 1772, she accompanied to England her brother William, who had established himself as a teacher of music in Bath. At once she became a valuable coöperator with her brother, both in his professional duties and in the astronomical researches to which he had already begun to devote all his spare time. She was the principal singer at his oratorio concerts, and acquired such a reputation as a vocalist that she was offered an engagement for the Birmingham festival, which, however, she declined. When her brother accepted the office of astronomer-royal, she became his constant assistant in his observations, and also executed the laborious calculations which were connected with them. For these services she in 1787 received from the king a salary of £50 a year. Her chief amusement during her leisure hours was to sweep the heavens with a small Newtonian telescope planted on the lawn.

Besides detecting by this means many of the small nebulae included in Sir William Herschel's catalogue, she succeeded in discovering seven comets, in the discovery of five of which she could lay claim to priority, viz., those of 1786, 1788, 1791, 1793, and 1795. In 1797 she presented to the Royal Society a catalogue of 560 stars taken from Flamsteed's observations, and not included in the British catalogue, together with a collection of errata that should be noticed in the same volume. Though she returned to Hanover in 1822 she did not abandon her astronomical studies, and in 1828 she completed the reduction, to January, 1800, of 2,500 nebulae discovered by her brother. In 1835, the Astronomical Society, to mark their sense of the benefits conferred on science by such a series of laborious exertions, unanimously resolved to present her with their gold medal, and also elected her an honorary member of the society. In 1846 she received a gold medal from the king of Prussia. She retained the use of her intellectual faculties, and also preserved her interest in science, to the close of a long life. Her death took place on January 9, 1848.

HERSCHEL, SIR FREDERICK WILLIAM, generally known as Sir William Herschel, one of the most illustrious of astronomers, was born at Hanover, November 15, 1738. His father was a musician employed as hautboy player in the Hanoverian guards. Herschel's earlier education was necessarily of a very limited character, but, being at all times an indomitable student, he, by his own exertions, more than repaired this deficiency of his youth. He became a very skillful musician, both theoretical and practical; while his attainments as a self-taught mathematician were fully adequate to the prosecution of those branches of astronomy which, by his labors and his genius, he so eminently advanced and adorned. Whatever he did he did methodically and thoroughly; and in this methodical thoroughness lay the secret of what Arago very properly terms his astonishing scientific success.

In 1755, at the age of seventeen, he joined the band of the Hanoverian guards, and with his detachment visited England, accompanied by his father and eldest brother; in the following year he returned to his native country, but two years later he finally quitted Hanover to seek his fortunes in England. As might have been expected, the earlier part of his career in his adopted country was attended with formidable difficulties and much privation. We find him engaged in several towns in the north of England as organist and teacher of music, but these were occupations not attended with any lucrative results. In 1766 the tide of his fortunes began to flow, inasmuch as he obtained the appointment of organist to the Octagon Chapel in Bath, at that time the resort of the wealth and fashion of the city, and of its numerous distinguished visitors.

The next five or six years of his life were spent in establishing his reputation as a musician, and he thereby eventually became the leading musical authority in the place, and the director of all the chief public musical entertainments. His circumstances having thus become easier, he revisited Hanover for the purpose of bringing back with him his sister Caroline, with the view of her rendering him such services as she could in his multifarious undertakings. She arrived in Bath with her brother in August, 1772, being at that time in her twenty-third year. In those days telescopes were very rare, very expensive, and not very efficient, for the Dollands had not as yet perfected even their beautiful little achromatics of two and three-quarter inches aperture. So Herschel was obliged to content himself with hiring a small Gregorian reflector of about two inches aperture, which he had seen exposed for loan in a trades-

man's shop. Not satisfied with this implement, he procured a small lens of about eighteen feet focal length, and set his sister to work on a pasteboard tube of that length, so as to make him a telescope. A tube of this construction naturally bent, and it was useless for all purposes but for the determined eyes of William Herschel. This material was soon displaced for tin, and thus a sorry sort of vision was obtained of Jupiter and Saturn and the moon. He then sought for a reflector of much larger dimensions from artists in London. No such instrument, however, was for sale; and the terms demanded for the construction of a reflecting telescope of five or six feet focal length he regarded as too exorbitant even for the gratification of such desires as his own. So he was driven to the only alternative that remained; he must construct a large telescope for himself. His first step in this direction was to purchase the debris of an amateur's implements for grinding and polishing small mirrors; and thus, by slow degrees, and by indomitable perseverance, he in 1774 had, as he says, the satisfaction of viewing the heavens with a Newtonian telescope of six feet focal length constructed by his own hands. But he was not a man to be contented with viewing the heavens as a mere star-gazer; on the contrary, he had from the very first conceived the gigantic project and the hope of surveying the entire heavens, and, if possible, of ascertaining the plan of their general structure on a settled and systematic mode of procedure, if only he could provide himself with adequate instrumental means. With this view he, his brother, and his sister toiled for many years at the grinding and polishing of hundreds of specula, always retaining the best, and recasting the others, until the best of the previous performances had been surpassed. After 1774 every available hour of the night was devoted to the long-hoped-for scrutiny of the skies. In those days no machinery had been invented for the construction of telescopic mirrors; the man who had the hardihood to undertake the polishing doomed himself to walk leisurely and uniformly round an upright post for many hours, without removing his hands from the mirror, until his work was done. On these occasions Herschel received his food from the hands of his faithful sister. But his reward was nigh.

In May, 1780, his first two papers containing some of the results of his astronomical observations during the last six years were communicated to the Royal Society through the influential introduction of Dr. Watson.

The subject of this first memoir was the varying luster of several of the stars, and especially that of Mira in the constellation of Cetus. It had been long known to fade in brightness from nearly that of a star of the first magnitude down to invisibility in such telescopes as then existed. Herschel had examined it, and many other variable stars, for himself; it was not, however, a simple or isolated phenomenon that engaged his attention; but, regarding the stars as so many suns, he examined stellar phenomena as possibly leading him to some intelligent conception of what might be occurring in our own sun. The sun, he knew rotated on its axis, and he knew that dark spots often exist on its photosphere; the questions that he put to himself were: Are there dark spots also on these variable stars? do the stars also rotate on their axes? or are they sometimes partially eclipsed by the intervention of some opaque and invisible bodies? And then he asked himself: What are these singular spots upon the sun? and have they any practical relations to us, the inhabitants of this planet? To these questions he applied his telescopes and his thoughts; and, as light from time to time dawned upon his apprehension, he communicated the results to the Royal Society in no less than six memoirs,

occupying many pages in the *Philosophical Transactions*, and extending in date from 1780 to 1801. It was in the latter year that these remarkable papers culminated in the inquiry whether any relation could be traced in the recurrence of sun-spots, regarded as evidences of solar activity (allied to volcanic), and the varying seasons of our planet, as exhibited by the varying price of corn. Herschel's solution of the question was scarcely final, and the question has recently cropped up again, with more than a renewal of its former interest.

In the following year (1781) he communicated to the Royal Society the first of a series of papers containing the results of his telescopic inquiries in relation to the rotation of the planets and of their several satellites. The object which he had in view was not so much to ascertain the velocities or times of their rotation, as rather to discover whether those rotations are strictly uniform. From the result he expected to gather, by analogy, the probability of an alteration in the length of our own day. These inquiries occupy the greater part of seven memoirs, extending from 1781 to 1797. In the course of these telescopic observations he lighted on the curious appearance of a white spot near to each of the poles of the planet Mars. On investigating the inclination of its axis to the plane of its orbit, and finding that it closely resembled that of our earth, he concluded that its changes of climate also would resemble our own, and that these white patches were probably polar snow. Modern investigations have confirmed his conclusions. He also discovered that, as far as his observations extended, the times of the rotations of the various satellites round their axes are in analogy with our own moon, viz., equal to the times of their revolution round their primaries. Here again we observe that his discoveries arise out of the complete and systematic and comprehensive nature of the investigation in which he is engaged. Nothing with such a man is accidental.

In the same year (1781) Herschel made a discovery which, as we shall see, soon completely altered the character of his professional life. In the course of his systematic examination of the heavens with a view to the discovery of the plan of their construction, he lighted on an object which at first he supposed to be a comet, but which, by its subsequent motions and appearance, turned out to be a new planet, moving outside of the orbit of Saturn. To this planet he in due time assigned the name of *Georgium Sidus*; but this name has by general consent been laid aside in favor of *Uranus*. It was discovered with a favorite seven foot reflector having an aperture of six and one-half inches; subsequently, when he had provided himself with a much more powerful telescope, of twenty feet focal length, he discovered what he believed to be no less than six satellites. Modern observations have shorn this gloomy planet of four of these supposed attendants, but at the same time have added two others apparently not observed by Herschel. No less than seven memoirs on the subject were communicated by him to the Royal Society, extending from the date of the discovery in 1781 to 1815. There is a peculiarity worthy of notice in Herschel's mode of observation which led to the discovery of this planet. He had observed that the spurious diameters of stars are not much affected by increasing the magnifying powers, but that the case is different with other celestial objects; hence if anything in his telescopic field attracted his notice by peculiarity of appearance, he immediately varied the magnifying power in order to decide the nature of the object. Thus *Uranus* was discovered; and had a similar method been applied to *Neptune*, that planet would have been discovered at Cambridge some months before it was recognized at Berlin.

We now come to the commencement of Herschel's most important series of observations, culminating in what ought probably to be regarded as his most capital discovery. A material part of the task which he had set himself as the work of his astronomical life embraced the determination of the relative distances of the stars from our sun and from each other. Now, in the course of his scrutiny of the heavens, he had observed many stars in apparently very close contiguity, but often greatly differing in their relative brightness. He concluded that, on the average, the brighter star would be the nearer to us, and the smaller enormously more distant. He considered that an astronomer on the earth, in consequence of its immense orbital displacement of some 180,000,000 of miles every six months, would see such a pair of stars under different perspective aspects; and this variety of perspective aspect observed and measured would, he thought, lead to an appropriate determination of their distance. With this view he mapped down the places and aspects of all the double stars that he met with, and communicated in 1782 and 1785 very extensive catalogues of the results. Indeed, the very last scientific memoir that he ever wrote, sent to the Royal Astronomical Society in the year 1822, at the time when he was its first president and in the eighty-fourth year of his age, related to these investigations. In the first of these memoirs he throws out the hint that these apparently contiguous stars must, if constituted after the material laws of our solar system, circulate round each other through the effects of gravitation; but he significantly adds that the time had not yet arrived for settling the question. Thus the philosopher abides his time in patience and confidence, and a dozen years afterward (1793) he remeasures the relative positions of many of these contiguous pairs, and we may conceive what his feelings must have been at finding the verification of his prediction. For he found that some of these stars had circulated round each other, after the manner required by the laws of gravitation. Thus Herschel had demonstrated the action of the same mechanical laws among the distant members of the starry firmament as bind together the harmonious motions of our solar system. This sublime discovery would of itself suffice to immortalize his memory in the respectful homage of all future races of intelligent men. If only Herschel had lived long enough to learn the approximate distances of some of these binary combinations, he would at once have been able to calculate their masses when compared with that of our own sun; and thus, knowing, as we now do, that these stars in their weights are strictly comparable with the weight of our own sun, he would have found another of his analogical conjectures realized.

In the year 1782, in consequence of his fame, Herschel was invited to Windsor by George III., and then accepted the offer made by the king to become his private astronomer, and henceforth devote himself wholly to a scientific career. The salary offered and accepted was £200 per annum, to which an addition of £50 per annum was subsequently made for the astronomical assistance of his faithful sister. In this way the great philosophical astronomer removed from Bath first to Datchet and soon afterward permanently to Slough, within the easy access of his royal patron at Windsor.

It was at Slough in 1783 that he wrote his first memorable paper on the *Motion of the Solar System in Space*—a sublime speculation, yet through his genius realized by considerations of the utmost simplicity. He returned to the same subject with fuller details in 1805. It was also after his removal to Slough that he published his first memoir containing his speculative ideas on the construction of the heavens, which from the first had

been the chief aim of his toils both of mind and body. In a long series of remarkable papers, addressed as usual to the Royal Society, and extending from the year 1784 to 1818, when he was eighty years of age, he demonstrated the fact that our sun is a star situated not far from the bifurcation of the Milky Way, and that all the stars visible to us lie more or less in clusters scattered throughout a comparatively thin stratum, but in the other two dimensions stretching immeasurably further into space. At one time he imagined that his powerful instruments had pierced through this stellar stratum of the Milky Way, and that he had approximately determined the form of some of its boundaries. In the last of his memoirs he had convinced himself of his error, and he admitted that to his telescopes our stratum of stars is "fathomless." Over this stratum of stars and their planetary attendants, the whole being in ceaseless motion round some common center of gravity as the resultant point of the combined gravitation, Herschel discovered on either side a canopy of discrete nebulous masses, from the condensation of at least a part of which the whole stellar universe had been formed—a magnificent conception, pursued with a force of genius and put to the practical test of observation with an industry almost incredible. It was the work of a single mind, carried to its termination with no assistance beyond that of a loyal sister, almost as remarkable a personage as himself.

Hitherto we have said nothing about that grand reflecting telescope, of forty feet focal length and four feet aperture, which is too often regarded as the chief effort of his genius and his perseverance. Gigantic as it really was, we are disposed to regard it as among the least of his great works. On the day that it was finished (August 28, 1789) Herschel saw at the first view, in a grandeur not witnessed before, the Saturnian system with all its six satellites, five of which had been discovered long before by Huygens or Cassini, while the sixth, later named Enceladus, he had, two years before, sighted by glimpses in his exquisite little telescope of six and one-half inches aperture, but now saw in unmistakable brightness with the towering giant he had just completed. On September 17th he discovered a seventh, which proved to be the nearest of all the satellites of Saturn. It has since that time received the name of Mimas. It is somewhat remarkable that, notwithstanding his long and repeated scrutinies of this planet, the eighth satellite, Hyperion, and the crape ring should have escaped him.

Herschel married the widow of Mr. John Pitt, a wealthy London merchant, on May 8, 1788, by whom he had an only son, John Frederick William. The prince regent conferred a Hanoverian knighthood upon Herschel in 1816. But a far more valued and less tardy distinction was the Copley medal assigned to him by his associates in the Royal Society in 1781. He died at Slough on August 25, 1822.

HERSCHEL, SIR JOHN FREDERICK WILLIAM, BART., the only son of Sir F. William Herschel, was born at Slough, Bucks, in 1792. His scholastic education commenced at Eton. Thence, at the early age of seventeen, he was sent to St. John's College, Cambridge, and the form and method of the mathematical instruction he there received exercised a material influence on the whole complexion of his scientific career. In due time the young student acquired the highest academical distinction of his year, graduating as senior wrangler. Two or three memoirs communicated to the Royal Society on new applications of mathematical analysis at once placed him in the front rank of the cultivators of this branch of knowledge. Of these his father had the gratification of introducing the first, but the others were presented in his own right as a fellow.

His first intention had been to study for the bar, and with this view he left the university, and placed himself under the guidance of an eminent special pleader of that day, but an early acquaintance with Doctor Wollaston in London soon changed the direction of his studies. In 1820, assisted by his father, he completed a mirror of eighteen inches diameter and twenty feet focal length, for a reflecting telescope. This, subsequently improved by his own hands, became the instrument which enabled him to effect the astronomical observations which, more than any other of his great works, form the basis of his fame. In 1821–23 we find him associated with Mr. South in the reëxamination of his father's double stars, by the aid of an achromatic telescope and other appliances, the like of which for excellence and power had not hitherto been collected. For this work in 1826 he received the recognition of the Astronomical Society by the award of their gold medal; the French Institute also presented him with the Lalande medal for the same contribution to astronomical science. In 1821 the Royal Society presented him with the Copley medal for his mathematical contributions to their *Transactions*. From 1824 to 1827 he held the distinguished and responsible post of secretary to that society. In 1827 he was elected to the chair of the Astronomical Society, which office he also filled on two subsequent occasions. In 1831 the honor of knighthood was conferred on him by William IV., and two years later he again received the recognition of the Royal Society by the award of one of their medals for his memoir *On the Investigation of the Orbits of Revolving Double Stars*.

Before the end of the year 1833, being then about forty years of age, Sir John Herschel had reëxamined all his father's discoveries of double stars and nebulae, and had added many similar bodies to his own list; this alone constituted a gigantic work even for the lifetime of any astronomer in that day. For it should be remembered that the astronomer was not as yet provided with those curious and valuable automatic contrivances for observing and for recording observations which at present most materially abridge the labor and increase the accuracy of astronomical work such as that in which Sir John had been engaged. And he had no assistant. Equatorial clocks for turning the telescope, electrical chronographs for recording the times of the phenomena observed, were at that date unknown.

His scientific life now entered another and very characteristic phase. The bias of his mind, as he subsequently was wont to declare, was toward chemistry and the phenomena of light, rather than toward astronomy. Indeed very shortly after taking his academical degree at Cambridge, he proposed himself as a candidate for the vacant chair of chemistry in that university; but, as he said with some humor, the result of the election was that of the votes he had a glorious minority of one. In fact Herschel had become an astronomer from a sense of duty, just as his father had become one by fascination and fixed resolve; hence it was by filial loyalty to his father's memory that he was now impelled to undertake the completion of that work which at Slough had been so grandly commenced. William Herschel had explored the northern heavens; John Herschel determined to explore the heavens of the south, as well as reëxplore the north. In accordance with this resolution, he and his family embarked for the Cape on November 13, 1833; they arrived in Table Bay on January 15, 1834.

To give an adequate description of the vast mass of labor completed during the next four busy years of his life at Feldhausen would require the transcription of a considerable portion of the *Cape Observations*, a volume which probably is not surpassed in varied interest or astronomical importance by any scientific work in exist-

ence. Herschel returned to his English home in the spring of 1838. As was natural and honorable to all concerned, he was welcomed with an enthusiastic greeting. By the queen at her coronation he was created a baronet.

Herschel was a highly accomplished chemist. His discovery of the solvent power of hyposulphite of soda on the otherwise insoluble salts of silver, in 1819, exercised a most important influence on the practical application of photography twenty years afterward; and in 1839, the natal year of that valuable art, he, independently of Mr. Fox Talbot, had discovered the means of taking and multiplying photographic pictures, and early in the spring of that year exhibited more than twenty photographic pictures to the Royal Society, including one of the old forty-foot telescope. He was the first person to introduce the now well-known terms *positive* and *negative* in photographic images, and to deposit upon glass a sensitized film for the reception of the picture. He also paved the way for Professor Stokes' important discovery of the change which luminous waves may suffer in their period of oscillation, by his addition of the lavender rays to the spectrum, and by his announcement of "epipolic dispersion," as exhibited by sulphate of quinine. Several other important and successful researches of his, connected with the undulatory theory of light, are scattered through the pages of his treatise on "Light" published in the *Encyclopædia Metropolitana*.

The main work of his declining years was the collection of all his father's catalogues, combined with his own observations and those of other astronomers of nebulae and double stars, each into a single volume. He lived to complete the former, and to present it to the Royal Society, who have published it in a separate form in the *Philosophical Transactions*. The latter work he had not fully completed at his death; but he bequeathed as much of it as was finished to the Astronomical Society. That society has printed a portion of it, which serves as an index to the observations of various astronomers on double stars up to the year 1866.

A complete list of his various contributions to learned societies will be found in the Royal Society's great catalogue, and from them may be gathered most of the records of his busy scientific life. Sir John Herschel met with an amount of public recognition which was unusual in the time of his illustrious father. Naturally he was a member of almost every important learned society in both hemispheres. For five years he held the office of master of the mint, the same appointment which, more than a century before, had been occupied by Sir Isaac Newton.

Herschel died at Collingwood, his residence near Hawkhurst in Kent, May 11, 1871, in the seventy-ninth year of his age, and his remains are interred in Westminster Abbey close to the grave of Sir Isaac Newton.

HERSENT, LOUIS, French painter, was one of David's most distinguished pupils, and became one of the most noted painters of the Restoration. He was born at Paris on March 10, 1777, and obtained the Prix de Rome in 1797; in the Salon of 1802 appeared his *Metamorphosis of Narcissus*, and he continued to exhibit with rare interruptions up to 1831. His most considerable works under the empire were *Achilles Parting from Briseis*, and *Atala Dying in the Arms of Chactas*; an *Incident of the Life of Fénélon*, painted in 1810, found a place at Malmaison, and *Passage of the Bridge at Landsend*, which belongs to the same date, is now at Versailles. Hersent's typical works, however, belong to the period of the Restoration. He continued in favor under Charles X., for whom was executed *Monks of Mount St. Gotthard*, exhibited in 1824. In 1831

Hersent made his last appearance at the Salon with portraits of Louis Philippe, Marie-Amélie, and the duke of Montpensier. After this date Hersent ceased to exhibit at the yearly salons. Although in 1846 he sent an excellent likeness of Delphine Gay, and one or two other works to the rooms of the Société d'Artistes, he could not be tempted from his usual reserve even by the international contest of 1855. Five years later, on October 2, 1860, he died.

HERSFELD, a town of Prussia, capital of a circle in the government district of Cassel, province of Hesse-Nassau, is situated at the confluence of the Geisa and Haune with the Fulda, ten miles north northeast of Fulda. Population about 8,500.

HERSTAL, or in its older form HERISTAL, a market-town of Belgium, on the left bank of the Meuse, three or four miles northeast of Liège, and skirting the road which leads from that city to Maestricht. Its population, which numbers 11,126, is mainly supported by its coal mines and iron industries.

HERTFORD, or HERTS, an inland county of England, lying north of Middlesex, south of Cambridgeshire and Bedfordshire, and west of Essex. Its area is 405,141 acres, all highly cultivated land, the county being about equally divided between pasture and arable farms. It is watered by numerous small streams, from three of which, the Lea, the Colne, and the New river (the latter an artificial conduit) part of the London water supply is obtained. The subdued beauty of the landscape and its contiguity to London have rendered this county for many years a favorite residential district, and it contains hundreds of country-seats of the nobility. It is well wooded and produces the best wheat in England. Much of the land is used as market gardens, and orchards are plentiful.

Farms average about 200 acres in extent, and cultivation is carried on with all modern improvements. Hertfordshire is traversed by four great trunk lines of railroad, the Great Eastern, Great Northern, Midland, and London & Northwestern. The old Roman roads to York, to St. Albans and Bedford, and to Warwick cross it, and its highways are among the best in the kingdom. The Grand Junction canal passes through its southwestern border and furnishes with its feeder, the Colne river, waterpower for hundreds of flour-mills. Hertfordshire contains numerous breweries, tanneries, tile works, and carriage factories. Its principal manufactures are, however, silk, paper, and straw plait.

The county town is Hertford, population, 8,000. Other towns, ranging from 9,000 to 4,000, are St. Albans, Hitchin, Watford, Bishop Stortford, Hemel Hempstead, Ware, Berkhamstead, Tring, and Barnet. The county returns three members to parliament, and the borough of Hertford sends one. The population in 1901 was 258,045.

Hertfordshire is one of the most interesting counties in England to the antiquary. Verulamium (now St. Albans) was the capital of the Cassii, whose chief, Cassivelaunus, was defeated by Cæsar 54 B.C., and numerous Roman earthworks are still visible. St. Alban, the proto-martyr of Britain, suffered death at the city named after him, and the abbey, still in magnificent preservation, was founded in 793 A.D. During the Wars of the Roses two great battles were fought at St. Albans, and at Barnet the earl of Warwick was defeated by Edward IV. Francis, Lord Bacon, lived at Gorbamby; Queen Elizabeth at Hatfield House, the present seat of the marquis of Salisbury; William Cowper at Berkhamstead, and Lord Lytton at Knebworth.

HERTZ, HENRIK, Danish poet, was born of Jewish parents in Copenhagen, August 25, 1798. At that date it was unusual for Jews to enjoy a professional educa-

tion, but young Hertz showed such marked literary bias that in 1817 he was sent to the university. Young Hertz was destined for the law, and passed his juridical examination in 1825. But his taste was all for polite literature, and in 1827 he came forward as a dramatic author by the publication of two plays, *Herr Burchardt and his Family* and *Love and Policy*; the latter enjoyed considerable success on the stage. In 1828 followed the comedy of *Flyttedagen*. In 1830 he brought out a complete novelty in Danish literature, a drama in rhymed verse, *Amor's Strokes of Genius*. In the same year Hertz published anonymously *Gjengangerbrøvene*, or Letters from a Ghost, which he pretended were written by Baggesen, who had died in 1826, and which were full of satirical humor and fine critical insight. The success of this book was overwhelming; Copenhagen talked of nothing else for a whole season; but Hertz preserved his anonymity, and the secret was not known until many years later. In 1832 he published a didactic poem, *Nature and Art*, and *Four Poetical Epistles*. *A Day on the Island of Als* was his next comedy, followed in 1835 by *The Only Fault*. In 1836 his comedy of *The Savings Bank* enjoyed a great success. But it was not till 1837 that he developed his most important talent by writing the romantic drama of *Svend Dyring's House*, a beautiful and original piece, which still holds the stage. His historical tragedy *Valdemar Atterdag* was not so well received in 1839; but in 1845 he achieved an immense success with his lyrical drama, *King Ren's Daughter*, which has been translated into almost every European language, and successfully acted all over the civilized world. To this succeeded the tragedy of *Ninon* in 1848, the romantic comedy of *Tonietta* in 1849, *A Sacrifice* in 1853, *The Youngest* in 1854. His lyrical poems appeared in successive collections, dated 1832, 1840 and 1844. From 1858 to 1859 he edited a very interesting literary journal entitled *Weekly Leaves*. He died in 1870.

HERTZEN, ALEXANDER, celebrated Russian author, was born at Moscow in 1812, a very short time before the occupation of that city by the French. In 1813 the family returned to Moscow, where Herten passed his youth—remaining there, after completing his studies at the university, till 1834, when he was arrested and tried on a charge of having assisted at a festival during which verses by Sokolovsky, of a nature uncomplimentary to the emperor, were sung. A special commission found him guilty, and in 1835 he was banished to Viatka. There he remained till the visit to that city of the hereditary grand duke (afterward Alexander II.), accompanied by the poet Joukofsky, led to his being allowed to quit Viatka for Vladimir, where he was appointed editor of the official gazette of that city. In 1840 he obtained a post in the ministry of the interior at St. Petersburg; but in consequence of having spoken too frankly about a death due to a police officer's violence, he was sent to Novgorod, where he led an official life, with the title of "state counselor," till 1842. In 1846 his father died, leaving him by his will a very large property. Early in 1847 he left Russia, never to return. From Italy, on hearing of the revolution of 1848, he hastened to Paris, whence he afterward went to Switzerland. In 1852 he quitted Geneva for London, where he settled for some years. In 1864 he returned to Geneva, and, after some time went to Paris, where he died, January 21, 1870.

His literary career began in 1842 with the publication of an essay, in Russian, on *Dilettantism in Science*, under the pseudonym of "Iskander," the Turkish form of his Christian name. His second work, also in Russian, was his *Letters on the Study of Nature* (1845-6). In 1847 appeared his novel *Kto Vinovat?*

(Whose fault?) From a literary point of view his most important work is *Kto Vinovat?* a story describing how the domestic happiness of a young tutor, who marries the unacknowledged daughter of a Russian sensualist of the old type, dull, ignorant, and genial, is troubled by a Russian sensualist of the new school, intelligent, accomplished and callous, without there being any possibility of saying who is most to be blamed for the tragic termination. But it was as a political writer that Herten gained the vast reputation which he at one time enjoyed. Having founded in London his "Free Russian Press," of the fortunes of which, during ten years, he gave an interesting account in a book published (in Russian) in 1863, he issued from it a great number of Russian works, all leveled against the system of government prevailing in Russia. Herten's writings, and the journals he edited, were smuggled wholesale into Russia, and their words resounded throughout that country, as well as all over Europe. Their influence became overwhelming. Evil deeds long hidden, evil-doers who had long prospered, were suddenly dragged into light and disgrace. His bold and vigorous language aptly expressed the thoughts which had long been secretly stirring Russian minds, and were now beginning to find a timid utterance at home. For some years his influence in Russia was a living force, the circulation of his writings was a vocation zealously pursued. When the Polish insurrection of 1863 broke out, and he pleaded the insurgents' cause, his reputation in Russia received its death-blow. From that time it was only with the revolutionary party that he was in full accord, and it is by that section of Russian Liberals alone that his opinions are now considered of authority.

HERULI, ÆRULI, or ERULI, a nomadic and warlike German tribe who inhabited the northern shores of the Black Sea, but afterward divided into various sections and wandered into different parts of Europe. They made their first appearance in history in the third century, as taking part with the Goths in their incursions against the eastern provinces of the Roman empire. In the fourth century they acknowledged the overlordship of the Gothic king Ermanric, but when Attila, king of the Huns, made his descent upon Gaul, they joined his standard. After the overthrow of the Huns, in which they suffered considerably, they established an organized and distinct confederacy on the banks of the Danube, and under the leadership of Odoacer, assisted in 476 in the overthrow of the Western empire. About the end of the sixth century they became submerged and lost in other nations, and disappeared from historical records.

HERVEY, JAMES, a popular religious writer of the eighteenth century, was born in England, near Northampton, February 26, 1714, and was educated at the grammar school of Northampton, whence in 1731 he passed to Lincoln College, Oxford. At the university he came under the influence of John Wesley and others of that school, and for some time manifested an inclination toward their theology; ultimately he adopted a thoroughly Calvinistic creed, and resolved to retain connection with the Established Church. Having taken holy orders in 1737, he became curate to his father in the family livings of Weston Favell and Collingtree, to which he himself succeeded in 1752. He wrote numerous religious works, which, though of but slight literary or theological value, rapidly became highly popular, and in many English and Scottish houses, especially of the humbler class, took a place on the same shelf with the *Pilgrim's Progress* and the *Whole Duty of Man*. His earliest work, *Meditations and Contemplations*, containing "Meditations Among the Tombs," "Reflections

on a Flower Garden," and a "Descant on Creation" (1746), and "Contemplation on the Night and Starry Heavens" (1747), said to have been modeled on Boyle's *Occasional Reflections on Various Subjects*, within fourteen years passed through as many editions. Hervey died on December 25, 1758.

HERVEY, JOHN HERVEY, LORD, the "Narcissus," "Sporus," and "Lord Fanny" of Pope's satire, a nobleman of political and social distinction in the reign of George II., was son of John, first earl of Bristol, and was born on October 13, 1696. Educated and trained for public life at Westminster and Clare Hall, Cambridge, he became a favorite of the court of the prince and princess (afterward George II. and Queen Caroline), to which Pope, Gay, Arbuthnot, Chesterfield, and other wits resorted, and which was celebrated for the beauty and accomplishments of its ladies, such as Miss Bellenden (afterward duchess of Argyle), Miss Howe, Miss Lepell, and Mrs. Howard, whose names will live forever in the poetry of Pope, Gay and Swift, and in the lively memoirs and correspondence of that brilliant circle. Hervey was married to Miss Lepell in 1720. Having entered the House of Commons as member for Bury (1725), he in 1730 received the appointment of vice-chamberlain to the king; in 1733 Sir Robert Walpole called him up to the House of Lords, where he proved a frequent and effective speaker; and in 1740 he succeeded Lord Godolphin as lord privy seal, which office he held until the Walpole administration was driven from power in 1742. Notwithstanding miserable health he continued to take an active part in politics until his death, which occurred on August 8, 1743. Lord Hervey was far above the intellectual rank assigned him by his merciless satirist, Pope. He wrote and spoke vigorously on public questions, was studious and laborious, a fair scholar, and a writer of pleasing occasional verses. The origin of the hostility which led to the allusion in the *Dunciad* (iv. 104) in 1728, and afterward to the attacks in the *Prologue* and *Epilogue to the Satires*, remains obscure.

HERZEGOVINA, an Illyrian province, ethnographically belonging to the Serbo-Croatian nationality, under the titular dominion of the Turkish sultan, but since 1878 administered by Austria-Hungary. The Turks included it in the vilayet of Bosnia. It is bounded north and east by Bosnia, south by Montenegro, and west by Dalmatia, only touching the Adriatic by the narrow enclaves of Klek and Sutorina. By the treaty of Berlin the Herzegovinian districts of Niksic and Dormitor have been placed under the government of the prince of Montenegro.

According to Roskiewicz the population of Herzegovina amounted in 1863 to 230,000 souls. With Bosnia, the population in 1896 numbered 1,568,092, (828,190 males and 739,902 females). During the troubles that ensued on the insurrection of 1875, about two-thirds of the Christian population fled beyond the Dalmatian and Montenegrin border, and the fearful mortality among these refugees largely diminished the Herzegovinian population. With the exception of the Gipsies, the Jews, and a small sprinkling of Osmanli officials, the whole population is Slavonic, the Mohammedians being for the most part renegade descendants of the feudal nobility that had formed itself here before the Turkish conquest. Much of the old Slavonic customs and family life still holds among the Herzegovinian Mussulmans, and here, as in Bosnia, polygamy is unknown.

The Serbo-Croatian language is spoken in its purest form in Herzegovina, and the Narenta valley has been called the Serbian Val d'Arno. The Orthodox Greek population is chiefly settled in the district east of the

Narenta; to the west of that river the population is mostly Roman Catholic, and the Mahometans inhabit the larger towns. Mostar, the capital, has a population of 15,000. Of the other towns, Ljubinski has, according to Klaić, a population of about 3,000 souls, Stolat, 3,500; Focha, 10,000; Niksic (now under Montenegro), 4,000; and Trebinje, 3,000.

Herzegovina, which has been described as the Turkish Switzerland, is divided into a variety of mountain plateaus by the parallel ranges of the Dinaric Alps; and the whole country is bisected by the river Narenta, which cleaves its way through the mountains from the Bosnian frontier towards the Adriatic. The valley of the Narenta and its tributaries forms the main artery of the province. There is situated the capital, Mostar; and a fine highroad, the only avenue of communication between Sereajevo (Bosna Serei) and the Adriatic, follows the river bank from the Dalmatian frontier to the Bosnian. The climate of Herzegovina is cold in winter and oppressively hot in summer. The sirocco is a prevalent wind, as well as the bora, the fearful north-northeaster of Illyria, which, sweeping down the lateral valleys of the Dinaric Alps, overwhelms everything in its path. The snow-fall is slight, and, except on a few of the loftier peaks, the snow soon melts. In the valleys, as that of the Narenta, the flora approaches that of Dalmatia and Southern Italy, and olives, mulberries, figs, melons, pomegranates, grapes, rice and maize flourish.

Herzegovina became a duchy in 1440, and was ultimately subject to the Turks, Venetians and Austrians during several hundred years. In July, 1875, the native population rose against their Turkish masters, and thus precipitated the Russo-Turkish war. By the treaty of Berlin the government of Bosnia and Herzegovina was confided to Austria, which now exercises suzerainty over the principalities. But the Turkish Sultan still claims sovereignty.

HERZOGENBUSCH, or HERTOGENBOSCH. See BOIS-LE-DUC.

HESEKIEL, GEORGE LOUIS, German author and journalist, was born August 12, 1818, in Halle. Hesi-kiel studied history and philosophy in Halle, Jena and Berlin, and devoted himself in early life to journalism and literature. In 1848 he settled in Berlin, where he died, February 26, 1874. He achieved a considerable reputation both as a writer of books and as editor of the *Neue Preussische Zeitung*.

HESIOD, the father of didactic poetry in Greece, is placed by Herodotus after Homer, but not more than 400 years before his own epoch; and, though the settlement of the question must depend on the internal evidence of the Hesiodic poems, this testimony is corroborated by the Parian marble and the historian Ephorus. He probably flourished about nine centuries before Christ. His father had migrated from Cyme in Æolia to Bœotia, exchanging there a seafaring life for agriculture; and Hesiod and his brother, a scapegrace named Perseus, were born at Ascra, near the base of Helicon and under the mountains which encircle Bœotia. His earliest poem, the famous *Works and Days*, embodies the experiences of his life afield, and, interwoven with episodes of fable, allegory and personal history, forms a sort of Bœotian shepherd's calendar. The connecting link of the whole poem is the author's advice to his brother, who appears to have bribed the corrupt judges to deprive Hesiod of his already scanty inheritance, and to whom, as he wasted his substance lounging in the agora, the poet more than once returned good for evil, though he tells him there will be a limit to this unmerited kindness. In the *Works and Days* the episodes which rise above an even didactic level are the *Creation and Equipment of Pandora*, the *Five*

Ages of the World and the much-admired *Description of Winter* (by some critics judged post-Hesiodic).

The other poem attributed to Hesiod or his school which has come down in great part to modern times is *The Theogony*, a work of grander scope, inspired alike by older traditions and abundant local associations. With the poet's history, apart from the evidence of his poems, we have little acquaintance. There is reason to suppose that in later life he removed from Ascra to Orchomenus, where, according to Pausanias, were his sepulcher and epitaph. Tradition has assigned a tragical ending to a life seemingly placid and unemotional; but the story that he met a violent death near the Locrian Cēneon in the territory of Naupactus, by reason of an intrigue with a sister of his host, or a guilty knowledge of such intrigue, is probably valueless except as evidence of the hero-worship of Hesiod in Locris and Bœotia.

HESPERIDES, maidens whose number is variously given as three, four, or seven, who guarded the golden apples which Earth gave Hera at her marriage to Zeus. They live far away in the west at the borders of Ocean, in other words at that point of heaven where the sun sets. Heracles is the hero who brings back the golden apples to mankind again. Like Perseus, he first applies to the Nymphs, who help him to learn where the garden is. Arrived there he slays the dragon and carries the apples to Argos; and finally, like Perseus, he gives them to Athene. The Hesperides are, like the Sirens, beautiful singers. They are said to be the daughters of Atlas; or, according to other accounts, they are the children of Erebus and Night, or Phorcys and Ceto, and are thus sisters of the Grææ, who also receive into their care the setting sun.

HESS. Among numerous German artists of this name, the following particularly deserve attention.

HEINRICH MARIA HESS—Von Hess, after he received a patent of personal nobility—was born at Düsseldorf in 1798, and brought up to the profession of art by his father, the engraver Karl Ernst Christoph Hess. Karl Hess had already acquired a name when in 1806 the elector of Bavaria, having been raised to kingship by Napoleon, transferred the Düsseldorf academy and gallery to Munich. In 1828 he was made professor of painting and director of all the art collections at Munich. He decorated the Aukirche, the Glyptothek, and the Allerheiligenkapelle at Munich with frescoes; and his cartoons were selected for glass windows in the cathedrals of Cologne and Ratisbon. Then came the great cycle of frescoes in the basilica of St. Boniface at Munich, and the monumental picture of the *Virgin and Child* enthroned between the four doctors, and receiving the homage of the four patrons of the Munich churches (now in the Pinakothek). His last work, the *Lord's Supper*, was found unfinished in his atelier after his death in 1863.

PETER HESS—afterward von Hess—was born at Düsseldorf in 1792, and accompanied his younger brother Heinrich Maria to Munich in 1806. He became a painter of skirmishes and battles. In 1813–15 he was allowed to join the staff of General Wrede, who commanded the Bavarians in the military operations which led to the abdication of Napoleon. In the course of years he successively visited Austria, Switzerland, and Italy. On Prince Otho's election to the Greek throne King Louis sent Peter Hess to Athens to gather materials for pictures of the war of liberation. The sketches which he then made were placed, forty in number, in the Pinakothek, after being copied in wax on a large scale (and little to the edification of German feeling) by Nilsen, in the northern arcades of the Hofgarten at Munich. He died suddenly at Munich in April, 1871.

KARL HESS, the third son of Karl Christoph Hess, born at Düsseldorf in 1801, was also taught by his father, who hoped that he would obtain distinction as an engraver. Karl, however, after engraving one plate after Adrian Ostade, turned to painting under the guidance of Wagenbauer of Munich, and then studied under his elder brother Peter. But historical composition proved to be as contrary to his taste as engraving, and he gave himself exclusively at last to illustrations of peasant life in the hill country of Bavaria. He died at Reichenhall on November 16, 1874.

HESSE, or HESSIA (in German *Hessen*), an old country of Germany, situated on both banks of the Rhine and Main, north and south of Frankfurt, has had different boundaries at different times. Its greatest length was about ninety-five miles, while its breadth has varied considerably. Several detached portions of territory were also included in Hesse.

Till the death of Philip the Magnanimous in 1567, Hesse continued to be regarded as one state, though sometimes shared by two rulers; but at that date Philip's four sons divided the landgraviate into Hesse-Cassel, Hesse-Marburg, Hesse-Rheinfels, and Hesse-Darmstadt. Of these the second and third lapsed by inheritance in 1583 and 1604 to the others, which became the chief lines. The small landgraviate of Hesse-Homburg was formed in 1596 of part of Hesse-Darmstadt. Hesse-Darmstadt, since the annexation of the other two to Prussia in 1866, has been the only independent part of Hesse left, and generally receives the common name. Hesse-Nassau is a province of Prussia, formed in 1866 from parts of Hesse-Cassel and the dukedom of Nassau. Hesse-Philippsthal was a collateral line of the house of Hesse-Cassel, founded in 1630, and extinct in 1820. Hesse-Barchfeld, Hesse-Butzbach, Hesse-Rothenburg, Hesse-Kumpenheim, and Hesse-Wanfried, were collateral lines of little importance.

HESSE-CASSEL, in German *KURHESSEN*, *i.e.*, Electoral Hesse, now forming the government district of Cassel in the Prussian province of Nassau, was, till 1866, a landgraviate and electorate of Germany, consisting of several detached masses of territory, to the northeast of Frankfurt-on-the-Main. It contains a superficial area of 6,060 square miles, and a population of (1900) 1,897,981.

HESSE-DARMSTADT, GRAND-DUCHY OF, the actual Hesse of the present day, is a state of Germany situated on the Rhine and Main, between Prussia on the north and Baden on the south. It consists of two large and several small detached portions of territory. The more northerly of the large portions forms the province of Oberhessen, and is completely surrounded by Prussia. The other, divided by the Rhine into the provinces of Starkenburg and Rheinhessen, is bounded on the north by Hesse-Nassau, on the west by the Rhine Palatinate and Rhenish Prussia, on the south by Baden, and on the east by Baden and Bavaria. The extent of the duchy is about 2,965 square miles. Oberhessen is mountainous, having the Vogelsberg in the east with Taufstein (2,579 feet) as the highest summit in the country, and the Hausberg, a branch of the Taunus, in the southwest. The chief rivers are the Rhine, Main, Neckar, Lahn, and Fulda, with their tributaries. There are no lakes, but mineral springs abound in all the provinces. Agriculture, including the breeding of horses and cattle, is actively encouraged by government, and is the principal industry of the people. Forestry and vine-growing are also important, the latter being practiced almost exclusively in Rheinhessen. The principal crops are millet, buckwheat, oats, and potatoes; but rape (for oil), hemp, flax, tobacco, and fruit are also cultivated. The manufactures embrace leather

(enameled and colored), tobacco, cigars, shoes, furniture, pocket-books, and similar goods, chemicals, matches, machinery, and various textile fabrics. Mining is carried on chiefly in Oberhessen. Iron, copper, manganese, graphite, lignite, salt, marble, and clay are the principal minerals, which are worked for home consumption. There is a university at Giessen, and the schools, ordinary, technical, and theological, throughout the country are very numerous. The Protestant religion predominates, though the Roman Catholic faith is also recognized by the state. Darmstadt is the capital; Offenbach is the chief manufacturing town; Mainz has perhaps the most active trade. The other chief towns are Alsfeld, Lauterbach, Friedberg, Bingen, Bensheim, and Worms. Population (1900), 1,119,893.

HESSÉ-HOMBURG, a former landgraviate of Germany, consisted of two parts, the province of Homburg-vor-der-Höhe, on the right bank of the Rhine, and the lordship of Meisenheim (added in 1815), on the left bank, to the north of Frankfort-on-the-Main. Homburg now forms part of the Prussian government district of Wiesbaden, and Meisenheim of the government district of Coblenz.

HESSIAN FLY, a name originally given in the United States in 1776 during the War of Independence to a small fly very destructive to wheat, supposed to have been brought over in straw by the Hessian troops employed on the British side. It is a species of *Cecidomyia*, described under the name *C. destructor* by the American entomologist Say, and belonging to the Dip-terous family *Cecidomyiidae*, the numerous members of which produce galls, distortions, and other injuries in the plants they attack. It was often thought that this insect occurred in England; but the indigenous English wheat-midge, also very destructive, is an allied species, *Diplosis tritici*. A species found in Hungary and Germany, where it has committed great damage, has been supposed to be the true Hessian fly, which has also been recorded from Minorca and Naples. Nevertheless, many good authorities have considered that the destructive European fly is not identical with the North American insect, though closely allied to it, and of similar habits. In the United States this minute midge has been a dreadful scourge at times, even to the extent of causing local famine. The female lays twenty or thirty eggs in a crease of the leaf of the young plant, and the larvæ when hatched work their way between the leaf and the stalk, till they come to a joint, a little below the surface, where they remain, head down, sucking the sap, and turn to pupæ inclosed in a covering; this is known as the "flax-seed" condition. The injury occasioned is not detected until the plant grows higher. There are two broods every year, one reaching the fly state in May, the other in August or early in September; as the fly only lives a few weeks, wheat that is sown so late as not to come up until the second brood has disappeared escapes harm. The usual result of the attack is that small aborted ears only are formed, the few grains of which shrivel and will scarcely ripen, the straw also being of inferior quality. The perfect insect is smaller than the common gnat, which it somewhat resembles, and from which its size and more simple antennæ distinguish it. The larvæ are spindle-shaped and reddish-white, with the intestinal canal showing through the skin when full grown; they are about one-seventh of an inch long, and are provided with small hooks near the head; at this stage they group themselves in regular rings round the stem attacked.

HESSUS, HELIUS EOBANUS, a distinguished German humanist of the sixteenth century, was born January 6, 1488, at Bockendorf, near Frankenberg, in Hesse, and died in 1540.

HESTIA, a Greek goddess, who is probably the latest in origin of the greater deities. She seems to belong to a particular stage in the advance of civilization, and to embody the religious sanction that confirmed the social system then reached. She is not mentioned in Homer; in the *Odyssey* sometimes one swears by Zeus, the table and the hearth, i. e., by Zeus as the god of the family, both in its external relation of hospitality and its internal unity round its own hearth. We find in Hestia relics of the old pre Greek worship; she is the altar-fire, presiding over all sacrifices, and sharing in the honors of all the gods. The opening sacrifice was offered to Hestia; to her at the sacrificial meal the first and the last libations were poured. The fire of Hestia was always kept burning, or if by any mischance it were extinguished, only sacred fire made by friction, or got direct from the sun, might be used to rekindle it. But beyond this she is the goddess of the family union, the personification of the idea of home, the protectress along with Zeus of the suppliants who fled for refuge to the hearth. To her, therefore, is ascribed the art of housebuilding. Hestia and Hermes are often united as the representatives of home and private life on the one hand, and of all business and outdoor life on the other.

HESYCHASTS, a quietistic sect which arose among the monks of the Greek Church, and especially of Mount Athos, during the later period of the Byzantine empire, and owing to various adventitious circumstances came into great prominence politically and ecclesiastically for a few years about the middle of the fourteenth century.

HESYCHIUS was a grammarian of Alexandria, as we learn from a letter prefixed to his great work. From the fact that he was apparently unknown to Hesychius the Milesian and other writers of the time of Justinian, M. Schmidt considers that he must have flourished later than 530 A.D. On the other hand he cannot have been later than 642 A.D., when the school of Alexandria was scattered by the Saracen conquest.

HETTSTÄDT, or HETTSTEDT, a town of Prussian Saxony, in the circle of Mansfeld, and the government district of Merseburg, is situated on both banks of the Wipper, about twenty-three miles northwest of Halle. Population, 6,000.

HEUGLIN, THEODOR VON, an eminent African and Arctic traveler, was born March 20, 1824, at Hirschlanden near Leonberg in Württemberg, and died at Stuttgart, November 5, 1876. Supplied with funds by his mother's liberality, Heuglin went to Egypt in 1851, and till 1865 the northeastern regions of Africa were the main scene of his labors. In 1852 he accompanied Doctor Reitz, the Austrian consul at Khartum, in his fatal journey to Abyssinia; in 1853, having been appointed Doctor Reitz's successor in the consulate, he visited Kordofan and the lower course of the White Nile; and in 1857, on his return after about two years' absence in Europe, he was commissioned by the grand-duke Ferdinand Maximilian of Austria to explore the countries along the west coast of the Red Sea. From the latter part of 1858 to the latter part of 1860 he was again in Europe; but in 1861 he was placed at the head of the Vogel search expedition, which included Munzinger, Steudner, Kinzelbach, etc., and was expected to make its way to Wadai. Having reached Mai-schecha, the explorers broke up into three parties, Heuglin turning along with Steudner and Schubert in the direction of Adoa, Gondar, and the Galla lands. At Khartum they joined Miss Tinne's party, and proceeded to Lake Rey and the Kosanga river, but Steudner died on April 10, 1863, and Heuglin was compelled by sickness to retrace his steps. He returned to Europe in 1865. In 1870 and 1871 he made a valuable series of explorations in Spitzbergen and

Novaya Zemlya; but 1875 found him again in North-east Africa, in the country of the Beni Amer and Habab. An invitation from the khedive took him abroad again in 1876, but receiving no definite appointment he returned to Europe. Later in the same year he was engaged in preparing for an exploration of the island of Socotra, when he was suddenly carried off by inflammation of the lungs.

HEUSCH, **WILLEM** or **GUILLIAM DE**, a landscape painter in the seventeenth century at Utrecht. The dates of this artist's birth and death are unknown. Nothing certain is recorded of him except that he presided over the guild of Utrecht, while Cornelis Poelenburg, Jan Both, and Jan Weenix formed the council of that body, in 1649. According to the majority of historians, Heusch was born in 1638, and was taught by Jan Both.

HEVELIUS, **HEVEL**, **HEWELKE**, or **HÖVELKE**, **JOHANN**, astronomer, was born at Dantzic on January 28, 1611, and died there on January 28, 1687.

HEXHAM, a market-town of England, county of Northumberland, is situated on the south bank of the river Tyne, crossed there by a handsome stone bridge of nine arches, twenty miles west from Newcastle and thirty-six east from Carlisle, and on the line of railway connecting those towns. Population, 8,000.

HEYDEN, **JAN VAN DER**, was born at Gorcum in 1637, and died at Amsterdam on September 12, 1712. He was an architectural landscape painter, a contemporary of Hobbema and Jacob Ruysdael, with the advantage, which they lacked, of a certain professional versatility; for while they painted admirable pictures and starved, he varied the practice of art with the study of mechanics, improved the fire engine, and died superintendent of the lighting and director of the firemen's company at Amsterdam.

HEYDUKE. See **HAJDUK**.

HEYLIN, **PETER** (1599–1662), an historical and polemical writer, born in England, November 29, 1599. Heylin was entered at Hart Hall, Oxford, in 1613; was of Magdalen College, 1615; B.A., July, 1617; M.A., 1620; B.D., 1629; D.D., 1633. In July, 1618, he began to read college lectures on cosmography (*i.e.*, geography) with such acceptance that his associates made him fellow of Magdalen. The lectures, under the title of *Microcosmos*, were published in 1621; and many editions of this useful book, each somewhat enlarged, subsequently appeared, until scarcely any scholar's library was without a copy. He was also made a prebendary of Westminster (November 9, 1631), treasurer to the chapter (1637), and subsequently sub-dean. He died in May, 1662.

HEYNE, **CHRISTIAN GOTTLÖB**, one of the most distinguished critics and archaeologists of the modern school of which Ernesti and Gesner were the founders, was born on September 25, 1729, in Chemnitz, Saxony. In 1748 he entered the university of Leipsic, with the professed intention of studying for the legal profession. He published his first edition of *Tibullus* in 1755, and in 1756 his *Epictetus*. On the death of Johann Matthias Gesner at Göttingen in 1761, the appointment to the vacant chair had been first offered to Ernesti, who, however, declined leaving the university of Leipsic, but proposed Ruhnken of Leyden or Saxe of Utrecht for the appointment. Ruhnken likewise refused it, but having been strongly impressed with the taste and learning displayed by the editor of *Tibullus* and *Epictetus*, he advised Münchhausen, the Hanoverian minister and principal curator of the university of Göttingen, to bestow the professorship on Heyne, who after some delay, became professor of eloquence in Göttingen. He refused the most advantageous and honorable overtures from Cassel, Berlin, and Dresden. As professor, prin-

cipal librarian, member of the Royal Society, and chief editor of the *Gelehrte Anzeigen*, and still more by his publications, he greatly contributed to raise the university of Göttingen to the distinguished rank it still holds among the seminaries of Europe. After a long and useful career, graced with all the distinctions which in Germany are conferred on literary eminence, he died, full of years and honor, on July 14, 1812.

HEYWOOD, a manufacturing town of Lancashire, is situated on the Roch, and on the Lancashire and Yorkshire Railway, three miles east of Bury and the same distance southwest of Rochdale. Population about 30,000.

HEYWOOD, **JOHN** (c. 1500–1565), sometimes styled “the Epigrammist,” was born, it is not known in what year, at North Mims near St. Albans. He was educated at Oxford, and afterward made the acquaintance of Sir Thomas More, who introduced him at court. His skill in music and his inexhaustible fund of ready wit made him a special favorite of Henry VIII., and afterward of his daughter Mary. On the accession of Elizabeth, Heywood, who was a zealous Catholic, retired to Malines in Belgium, where he died.

HEYWOOD, **THOMAS**, a voluminous dramatist and miscellaneous author of the sixteenth and seventeenth centuries, was born in Lincolnshire and was educated at Cambridge, where he became a fellow of Peterhouse. The dates of his birth and death are alike unknown, and the few facts of his life that are preserved have been gleaned chiefly from his own writings.

HEZEKIAH (“Jehovah makes strong;” *Ezechias*; the *Ha-za-ki-ya-hu* or *Ha-za-ki-a-hu* of the Assyrian inscriptions), one of the greatest and best of the kings of Judah, succeeded his father Ahaz when still a young man. The year of his accession was most probably 717 B.C.; and he ruled for twenty-nine years with a vigor and a success that deeply impressed later historians. The outset of his reign was marked by an emphatic reversal, both in foreign and in domestic affairs, of the policy which had been so disastrously followed by his weak and foolish predecessor. While Ahaz had shown distinctly paganizing tendencies in religion, Hezekiah was ardent in his zeal for the exclusive worship of Jehovah, which he sought to simplify, centralize, and refine even at the expense of abolishing many cherished institutions which had the sanction of ancient usage. As in the internal religious affairs of the theocratic kingdom so in its relations with foreign powers Hezekiah innovated very conspicuously on the policy of his father, although not here entirely on the lines laid down by the great contemporary prophet. Confirmed in the consciousness of military strength by a successful war against the Philistines, and having no longer anything to fear either from Damascus or from Samaria, he began to cherish the hope (at least with Egyptian support and the active coöperation of Egyptian cavalry) of being able to shake off entirely the yoke of Assyria, and with this view he set about extensive fortifications and other engineering works in and about Jerusalem. It was not, however, until after the accession of Sennacherib (705) and the resolution of that monarch to direct one of his great expeditions against Egypt (c. 701), that matters were brought to a sharp and immediate crisis between Nineveh and Jerusalem. The capture of all his fenced cities, Jerusalem excepted, coupled with the inactivity of Egypt, convinced Hezekiah of the uselessness of a struggle with the greatest military power of his century, in a way that Isaiah, with often repeated admonitions, had failed to do; and the payment of a large sum of money by way of tribute readily purchased a temporary relief. The sickness and recovery of Hezekiah seemed to have

preceded the invasion of Sennacherib by three years at most. Of the latter portion of Hezekiah's reign no details have been preserved; but it appears to have been characterized by peace and prosperity. He was succeeded in 688 by Manasseh, his son by Hephzibah, born apparently about 702.

HIBERNATION is the term employed by naturalists to denote the peculiar state of torpor in which many animals which inhabit cold or temperate climates pass the winter. In hot and dry countries, on the contrary, various animals pass into a similar condition during the hottest season of the year; and this state is called "Æstivation." Several of the animals which hibernate during the winter are liable to fall into a similar state at intervals during mild weather, and Dr. Marshall Hall has applied the term "Diurnation" to the day-sleep of bats, which he regards as precisely analogous to hibernation.

Although comparatively few mammals hibernate, the phenomena of hibernation and similar conditions have been better studied in this class than in any other. Dr. Marshall Hall has laid down the principle that the amount of respiration is inversely as the degree of irritability of the muscular fiber. Every gradation may be met with between ordinary sleep, the imperfect or abnormal hibernation of some animals, and the profound hibernation of others, in which all the functions of life are almost suspended. Such a condition is always accompanied by reduced respiration and increased irritability of the muscular fiber. If the respiration is reduced without this irritability being increased death results from torpor and asphyxia, whereas, if the respiration is increased simultaneously with increased irritability (as when an animal is aroused too suddenly), death likewise results from too great stimulation of the vital powers. The well-known danger of suddenly awakening a patient from a state of somnambulism is doubtless due to a similar cause.

Hibernation, however, is a physiological condition, and not produced simply by cold, though it is favored by it, because cold induces sleep, which may afterward pass into hibernation. It is an error to suppose that hibernating animals are capable of resisting any amount of cold, though their capacity of doing so must vary according to their species and to the climate which they inhabit. They always seek secure hiding-places where they may be protected from too great a degree of cold, as well as from interference. During hibernation the temperature of their bodies sinks to a point corresponding nearly to that of the surrounding atmosphere; but if they are exposed to an unusual amount of cold they are first awakened by it, and then sink into a fatal torpor like other animals. Many hibernating animals perish in this manner during severe winters. Respiration being almost suspended during hibernation, the maintenance of vitality depends almost wholly on the action of the heart, which will continue for a long time after an hibernating animal has been decapitated. Animals may also be placed in carbonic acid or under water for several hours without injury when in this condition, though they would die in a very few minutes if they were in their normal state.

Long-continued suspension of consciousness in man, whether voluntary or otherwise, is rare in temperate climates, but it is more frequent in India, where some religious ascetics are stated on unimpeachable authority to possess the power of throwing themselves into a state closely resembling hibernation for an indefinite period. Many curious cases have been recorded by Mr. Braid in his small treatise on *Human Hibernation*, published in 1850, the most celebrated of which is that of a fakir who was actually buried alive at Lahore, in 1837, in the

presence of Rumjeet Singh and Sir Claude Wade, and who was dug up and restored to consciousness several months afterward, after every precaution had been taken to prevent any one from disturbing the grave in the interval. Among the mammals the bear, badger, hedgehog, porcupine, dormouse, and squirrel hibernate. Bats sleep almost all the winter.

Amphibia and Reptilia hibernate in cold or temperate climates. Land tortoises bury themselves in holes in the ground, and fresh-water tortoises in the banks or at the bottom of lakes and rivers. Lizards and snakes retire to holes in trees, under stones, or among dead leaves, where many species congregate in large numbers, and pass the winter closely entwined, and in a still more torpid condition than that of the hibernating mammals, their digestion and respiration being entirely suspended. Many tortoises, crocodiles and serpents bury themselves in mud in both South America and Africa, and æstivate in the hard-baked ground during the dry season of the year. When the viper is disturbed during the winter its bite is harmless; but this is not the case with the venomous serpents which æstivate in tropical countries.

HICCUP, or **HICCOUGH**, consists of sudden, short, convulsive inspirations, attended with a peculiar sound produced in the larynx, and immediately followed by expiration. The paroxysm may last only a few minutes, or may extend to hours or days; in the last-named case, it may be dangerous to life, from the exhaustion which it causes, but usually it merely excites a feeling of uneasiness or slight pain about the region of the diaphragm. When the attack is slight, it may often be stopped by making a very full inspiration, and then holding the breath as long as possible. Strong pressure, as a belt tightly drawn round the waist, will sometimes give relief. In more obstinate cases, aromatic spirit of ammonia, camphor, musk, etc., may be resorted to. A combination of camphor and chloroform, and the frequent swallowing of small-rounded pieces of ice, are perhaps the most efficient remedies.

HICKES, **GEORGE** (1642–1715), a learned English divine of the nonjuring party, and an eminent Anglo-Saxon scholar, was born at Newsham near Thirsk, Yorkshire. In 1659 he entered St. John's College, Oxford, whence after the Restoration he removed first to Magdalen College and subsequently to Magdalen Hall. In 1664 he was chosen fellow of Lincoln College, and in the following year proceeded M.A. On his return from a Continental tour in 1673 he graduated in divinity, and in 1675 he was appointed rector of St. Ebbe's, Oxford; in the following year he as private chaplain accompanied the duke of Lauderdale, the royal commissioner, to Scotland; and shortly afterward he received the degree of D.D. from the university of Glasgow. In 1680 he became vicar of All Hallows, Barking, London, and after having been made chaplain to the king in 1681, he was in 1683 promoted to the deanery of Worcester. At the revolution of 1688, having declined to take the oath of allegiance to William and Mary, he was first suspended and afterward deprived. He died in 1715.

HICKORY. The hickory trees are natives of North America, and belong to the genus *Carya* of botanists. They are closely allied to the walnuts (*Juglans*), the chief, or at least one very obvious difference being that, while in *Carya* the husk which covers the shell of the nut separates into four valves, in *Juglans* it consists of but one piece, which bursts irregularly. The hickory trees are of lofty growth, and are held in high estimation, both on account of their durable timber, and from the excellent nuts which some of the species produce. The timber is both strong and heavy, and remarkable

its extreme elasticity, but it is not much used either for shipbuilding or for architectural purposes, as it decays rapidly when exposed to heat and moisture, and is peculiarly subject to the attacks of worms. It is very extensively employed in manufacturing musket stocks, axle-trees, screws, rake teeth, the bows of yokes, the wooden rings used on the rigging of vessels, chair backs, axe-handles, whip-handles, and other purposes requiring great strength and elasticity. Its principal use in America is for hoop-making; and when it is remembered how large a proportion of the productions of the United States is packed in barrels, some estimate may be formed of the consumption of hoops and of the consequent demand for hickory wood, which is the only American wood found perfectly fit for that purpose.

The wood of the hickory is of great value as fuel, on account of the brilliancy with which it burns and the ardent heat which it gives out, the charcoal being heavy, compact, and long-lived. The species which furnish the best wood are *Carya alba* (shellbark hickory), *C. tomentosa* (mockernut), *C. oliviformis* (pecan or pecane nut), and *C. porcina* (pig-nut). That of the last named, on account of its extreme tenacity, being preferred for axle-trees and axe-handles. The wood of *C. alba* splits very easily and is very elastic, so that it is much used for making whip-handles and baskets; the whip-handles are greatly esteemed for their suppleness, and considerable numbers of them are annually exported to England. The wood of this species is also used for making the back bows of Windsor chairs.

Most of the hickories form fine-looking, noble trees of from sixty to ninety feet in height, with straight, symmetrical trunks, well-balanced ample heads, and bold, handsome, pinnated foliage. When confined in the forest they shoot up fifty or sixty feet without branches, but when standing alone they expand into a fine head, and produce a lofty round-headed pyramid of foliage. They have all the qualities which are necessary to constitute fine graceful park trees, and are justly entitled to a place in every considerable plantation. The most ornamental of the species are *C. oliviformis*, *C. alba* and *C. porcina*, the last two also producing delicious nuts, and being worthy of cultivation for their fruit alone.

The husk of the hickory nut, as already stated, breaks up into four equal valves or separates into four equal portions in the upper part, while the nut itself is tolerably even on the surface, but has four or more blunt angles in its transverse outline. The hickory nuts of the American markets are the produce of *C. alba*, which is called the shell-bark hickory, because of the roughness of its bark, which becomes loosened from the trunk in long scales bending outward at the extremities and adhering only by the middle. The nuts are much esteemed in all parts of the Union, and are exported in considerable quantities to Europe. The pecan-nuts, which come from the Western States, are from an inch to an inch and a half long, smooth, cylindrical, pointed at the ends, and thin-shelled, with the kernels full, not like those of most of the hickories divided by partitions, and of delicate and agreeable flavor. The thick-shelled fruits of the pig-nut are generally left on the ground for swine, squirrels, etc., to devour. In *C. amara* the kernel is so bitter that even the squirrels refuse to eat it.

HICKS, ELIAS, founder of the Hicksites, one of the two great sections into which the Society of Friends in America has, since 1828, been divided (see QUAKERS), was born at Hempstead, Long Island, on March 19, 1748. During the earlier part of his life he followed the business of a carpenter and housebuilder; but this occupation he latterly exchanged for that of farming. Reared in a Quaker family, he began, when about

twenty-seven years of age, to "have openings leading to the ministry," and to be "deeply engaged for the right administration of discipline and order in the church." In the intervals of business, accordingly, he began to visit the meetings and families of Friends throughout an extensive range of country; and soon established a very considerable reputation as an efficient and popular itinerant preacher. His first literary effort seems to have been made no earlier than 1811, when he published *Observations on Slavery*; those doctrinal divergences from the received orthodox creed of the Friends, by which his name was brought into the prominence it now possesses, appear not to have become visible until 1820, when he wrote a *Doctrinal Epistle* (published in 1824), which was followed by much controversy, and resulted in 1828 in the formal separation from the Hicksites of their more orthodox Quaker brethren. The points involved were justly considered to affect the fundamental doctrines of the Christian religion, such as those of the Trinity, the Incarnation, and the supreme authority of Scripture. Hicks died at Jericho, Long Island, on February 27, 1830.

HIERAPOLIS. Of the many cities in the Greek world bearing this name the following are the most important.

1. A city of Syria Cyrrhestica, situated on some hills about sixteen miles southwest from the junction of the Euphrates and the Sajur. Besides the natural strength of its position, it was important as lying on the line of intercourse between Northern Syria and Mesopotamia, and was always a great trading city. Its early history is quite unknown.

2. A city in Phrygia, at the junction of the Lycus and Meander, on the road from Apamea to Sardis. In it there were warm springs which had and still have a remarkable power of forming incrustations. Its name, Hierapolis, is due to the sanctity conferred on it by these hot springs, and by the Plutonium, a small cave under a projecting rock, from which there constantly emanated a dark vapor, deadly to man and beast.

HIERARCHY. From *ἱεράρχης*, meaning a steward or guardian of holy things, is derived *ἱεραρχία*, naturally signifying the office of such a steward or guardian, but most commonly used in ecclesiastical language to denote the aggregate of those persons who exercise authority within the Christian Church—the patriarchate, episcopate, or entire threefold order of the clergy. The word, which does not occur in any classical Greek writer, owes its present extensive currency to the celebrated writings of Dionysius Pseudo-Areopagita, which, originating probably in the age of Justinian, exerted, during the ninth and following centuries, so remarkable an influence on the current of theological speculation, both in the Eastern and in the Western Church. Of these the most important are the two which treat of the celestial and of the ecclesiastical hierarchy, respectively. Defining hierarchy as the "function which comprises all sacred things," or, more fully, as "a sacred order and science and activity, assimilated as far as possible to the godlike, and elevated to the imitation of God proportionately to the Divine illuminations conceded to it," the author proceeds to enumerate the nine orders of the heavenly host, which are subdivided again into hierarchies or triads, in descending order, thus: Seraphim, Cherubim, Thrones; Dominations, Virtues, Powers; Principalities, Archangels, Angels. These all exist for the common object of raising men through ascending stages of purification and illumination to perfection. The ecclesiastical or earthly hierarchy is the counterpart of the other. In it the first or highest triad is formed by baptism, communion and chrism. The second triad consists of the three orders of the ministry, bishop or hierarch, priest

and minister or deacon; this is the earliest known instance in which the title hierarch is applied to a bishop. The third or lowest triad is made up of monks, "initiated," and catechumens.

Some kind of hierarchy, both of orders and of jurisdiction, may, from the nature of the case, be looked for in every religious system that has attained any considerable degree of visibility and external organization. The ancient Jewish and Egyptian hierarchies, for example, find parallels in Parsism and Mahometanism; while in some regions Buddhism has attained a degree of complexity in its ecclesiastical government strikingly suggestive of many features of the present Roman hierarchy.

HIERAX, or **HIERACAS**, a learned ascetic who flourished about the end of the third century at Leontopolis in Egypt, where he lived to the age of ninety, supporting himself by calligraphy and devoting his leisure to scientific and literary pursuits, especially to the study of the Bible. He was the author of Biblical commentaries both in Greek and Coptic, and is said to have composed many hymns.

HIERO, the name of two rulers of Syracuse.

HIERO I., displacing his infant nephew, succeeded his famous brother Gelon as tyrant of Syracuse in 478 B.C. His rule was more tyrannical than Gelon's had been. He removed the inhabitants of Naxos and Catania to Leontini, and peopled Catania, which he renamed Aetna, with Dorians. He was also an important factor in the history of Agrigentum, of Rhegium, and of Loeri; and he saved the Greeks of Campania from the Etruscans, whose naval power he destroyed by his great victory at Cumæ, (474 B.C.) Though despotic in his rule, he was a hearty patron of literature, and numbered among his friends such names as Æschylus, Bacchylides, Epicharmus, Simonides, and Pindar—the last of whom celebrated his victories in the Grecian games. He died at Catania in 467 B.C.

HIERO II., king of Syracuse, was an illegitimate son of a Syracusan noble, Hierocles, who claimed descent from Gelon (see **GELON**). His birth must have taken place before the year 306 B.C. On the departure of Pyrrhus from Sicily (in 275 or end of 276 B.C.), the Syracusan army and citizens alike marked their approval of Hiero's military and popular qualities by placing him at the head of the troops. He raised a native force, with which he drove the Mamertines into the corner of the island, defeated them in a pitched battle, and was prevented from capturing Messana only by Carthaginian interference. His grateful countrymen then chose him king (270 B.C.) In 264 he again returned to the attack, and the Mamertines called in the aid of Rome. Hiero joined the Punic leader Hanno, who had newly landed in Sicily; but, being defeated by the consul, Appius Claudius, he withdrew to Syracuse. Pressed by the Roman forces, he was in 263 compelled to conclude a treaty with Rome, by which he was to rule over the southeast of Sicily and the eastern coast to Tauromentum. From this time till his death in 216 he remained the fast friend of Rome, rendering frequent and valuable service during the First Punic War by supplying men, material, and provisions. When the Second Punic War broke out, he joined his fleet to that of Sempronius, and offered supplies of food and clothing. At home he was a wise and just ruler. He restrained the republican senate, and governed as a constitutional monarch. He kept up a powerful fleet for defensive purposes, and employed his famous kinsman, Archimedes, in the construction of those engines that, at a later date, played so important a part during the siege of Syracuse by the Romans. His only son, Gelon, predeceased him, and he was succeeded by his grandson, Hieronymus.

HIEROCLES, a Roman proconsul, first of Bithynia and afterward of Alexandria, flourished during the reign of Diocletian (284–305 A. D.), and is said to have been the instigator of the fierce persecution of the Christians under Galerius Cæsar in 303.

HIEROCLES, a Neo-Platonic writer of the fifth century A.D., was apparently a native of Alexandria. He was born most probably about the beginning of the fifth century, studied under the celebrated Neo-Platonist Plutarch at Athens, and taught for some years in his native town. He seems to have been banished from Alexandria and to have taken up his abode in Constantinople, where he endured some persecution for his religious opinions. His death must be referred to the closing decade of the fifth century, probably about 490. The only complete work of his which has come down to us is the commentary on the great Pythagorean *Carmen Aureum*, but several other writings, specially one on Providence or Foreknowledge, are quoted or referred to by Photius and Stobæus.

HIEROGLYPHICS. The term hieroglyphics is used, with others, by Greek and Latin writers to describe the sacred characters of the ancient Egyptian language in its classical phase. It is used by the moderns for various systems of writing in which figures of objects take the place of conventional signs. The written language of the ancient Egyptians remained the same from the date of the earliest monuments (Third Dynasty) until the age of the Ethiopian kings (B.C. *cir.* 700), when a vulgar dialect expressing the common speech is first found in written documents. Then, if not earlier, the older phase of the language became the classical Egyptian, sometimes called the sacred dialect, to distinguish it from the vulgar dialect. The classical Egyptian was used almost as late as the fall of paganism generally, for all documents but legal and commercial ones, for which the vulgar dialect was used.

It is necessary to observe that, although Egyptian is not proved to be a Semitic language, it contains in its oldest known form undoubted Semitic elements, both in structure and roots. It must also be borne in mind that the grammar of ancient Egyptian is in its infancy. We know many of its principal facts, but we do not know them accurately. For instance, we know the forms of many tenses of the verb, and can perhaps place these tenses in groups, as past, present and future, but we cannot define the different senses of the various tenses of each group. Similarly, in Coptic we do not always know the shades of difference within a group of tenses. It may be that in Coptic these shades have disappeared through the decay of the language, but it would be rash to affirm this of the classical Egyptian.

The elements of Egyptian writing are composed of a certain number of actual objects, natural or artificial, imitated by drawing or engraving.

Egyptian writing falls into three systems—(1) hieroglyphic, (2) hieratic, (3) demotic or enchorial, the hieratic being a simplified form of hieroglyphic, and the demotic of hieratic. The complete designing of hieroglyphics required skill and time. They thus came to be reduced in writing to the simplest forms which retained the leading characteristics. These were called by Champollion linear hieroglyphics. The linear forms not lending themselves with sufficient readiness to very rapid writing, a further abbreviation was made, by which the forms became almost conventional—the original type usually ceasing to be immediately recognizable; this cursive system Champollion called hieratic. The demotic writing is a new abbreviation of the hieratic; it gradually departs so far from the original types as to appear to consist of arbitrary signs.

Hieroglyphics are written either in horizontal lines or

vertical columns, and are ordinarily read from the right. The heads of animals and the like show from what direction to begin reading. Hieratic and demotic are written from right to left, in horizontal lines. In very early times hieratic is sometimes written in vertical columns.

The hieroglyphic is a lapidary system, the hieratic and demotic purely systems for common writing. Consequently the hieroglyphic is the most difficult of the three to read, as the engraver or painter paid great attention to the symmetrical appearance of each group of signs, and grammatical forms were hence often omitted. In hieratic and demotic the signs follow each other without interruption of the natural order, and the grammatical forms are usually given, and even more fully.

Intentionally accumulated exceptions in certain texts compose what Champollion has called the Secret Writing. The most ancient traces we have found are of the Eighteenth Dynasty. In this system we remark—(1) objects rare or unused in ordinary writing; (2) syllabic signs used as simple letters; (3) phonetic values obtained by turning the signs from their ordinary ideographic values; (4) variants between the values of neighboring sounds. Thus every deviation was made from the usual principles of writing by which it was possible to produce exceptions. This is an enigmatic system intended to be unintelligible to the ordinary reader. The causes of this method are of interest, for from them originated the new values which strangely complicate the hieroglyphic writing of the time of the Greeks and Romans (the secret writing thus passing in a certain degree into the common writing).

HIERONYMITES, HIERONYMIANI, or SANCTI HIERONYMI EREMITÆ, an order of monks, originally hermits, who resolved to adopt the cenobite life under the patronage of St. Jerome and the rule of St. Augustine. The order first arose in the fourteenth century in the neighborhood of Toledo. It received papal sanction (from Gregory XI. in 1373), and made considerable progress in Spain and Portugal. From about the close of the sixteenth century it rapidly decayed, and now it is wholly extinct.

HIGDON, or HIGDEN, RANULF, was a Benedictine monk of the monastery of St. Werberg in Chester, in which he lived, it is said, for sixty-four years, and died "in a good old age," probably in the year 1363. Higdon was the author of a long chronicle, one of several such works based on a plan taken from Scripture, and written for the amusement and instruction of the society to which the compiler belonged. Its chief interest perhaps lies in the fact that it closes the long series of general chronicles, which were soon put completely out of date by the invention of printing.

HIGHGATE, a suburb of London, county of Middlesex, is situated on an eminence on the great north road, five and one-half miles northwest of London. From various points on the hill, which reaches a height of 426 feet, striking views are obtained of London and its suburbs. The North London cemetery in the neighborhood contains the graves and monuments of a great number of celebrities. Highgate is supposed by some to have received its name from the gate erected by the bishop of London for the purpose of receiving toll from the passengers by the road which at this point entered his park; but it is possible that gate is here used according to its old signification, and that the name simply means high road. The road was constructed in the fourteenth century, and the toll-house was built on the site of an ancient hermitage. In the time of stage-coaches a custom was introduced of making ignorant persons believe that they required to be sworn and ad-

mitted to the freedom of the Highgate before being allowed to pass the gate, the fine of admission being a bottle of wine, which was discussed at the conclusion of the ceremony. The population of the parish is about 12,000.

HIGH PLACE is the rendering invariably given in the authorized English version of the Old Testament Scriptures to a Hebrew word מַצְבֵּה of uncertain deriva-

tion but with much plausibility connected by Gesenius with the Indo-Germanic root which appears in the Persian *bam* (roof, summit). The habit so widely diffused among primitive people of selecting the tops of mountains, or at least elevated sites, as suitable from their comparative isolation from the world and their supposed nearness to the sky for the erection of altars and sacred pillars, is so obviously natural as to require no explanation. Along with that of worshiping under trees or groves (see GROVE), it was fully participated in by the Israelites from an early period, and continued to assert itself down to a very late date, as is abundantly shown by the frequency with which *bamah* and other words signifying height occur in connection with their public and private worship, whether Jehovistic or idolatrous.

HIGHWAYS. A highway is a public road over which all persons have full right of way—walking, riding, or driving. See ROADS.

Highway, in the law of the States of the American Union, generally means a lawful public road, over which all citizens are allowed to pass and repass on foot, on horseback, in carriages and wagons. Sometimes it is held to be restricted to county roads as opposed to town-ways. In statutes dealing with offenses connected with the highway, such as gaming, negligence of carriers, etc., "highway" includes navigable rivers. But in a statute punishing with death robbery on the highway, railways were held not to be included in the term. In one case it has been held that any way is a highway which has been used as such for fifty years.

HILARION, Sr., abbot, the first to introduce the monastic system into Palestine, was born of heathen parents at Tabatha, about five miles to the south of Gaza, about the year 288; was sent when very young to Alexandria to be educated, and there became a convert to the Christian religion. Attracted by the fame of St. Anthony, he went to visit that saint in his solitude, and forthwith became a disciple, and withdrew into loneliness in the desert between the sea and the marshes on the Egyptian border. In this solitude he observed the most rigid asceticism, and (to quote the quaint remark of Butler) "thought himself at liberty to practice certain mortifications, which the respect we owe to our neighbor makes unseasonable to the world." He died in 371.

HILARIUS, or HILARUS (HILARY), bishop of Rome from 461 to 467, who, according to some authorities, had attained to the archidiaconate as early as the year 417, is known to have been a deacon, and to have acted as legate to Leo the Great at the "robber" synod of Ephesus in 449. Chosen to succeed Leo on November 12, 461, he issued a brief *de fide catholica*, in which he anathematized Eutyches, Nestorius and Dioscurus, and reaffirmed the decisions of the councils of Nice, Ephesus and Chalcedon. In 465 he held at Rome a council, which put a stop to some prevalent abuses, particularly to that of bishops appointing their own successors. His pontificate was also marked by a successful encroachment of the papal authority on the metropolitan rights of the French and Spanish hierarchy, and by a resistance to the toleration edict of Anthemius, which ultimately caused it to be recalled. Hilarius, who died November 17, 467, was succeeded by Simplicius.

HILARIUS, St. of Arles, an eminent prelate and an able if unsuccessful defender of the liberties of the Gallican Church, was born about 403, and in early youth entered the abbey of Lerins, then presided over by his kinsman Honoratus (St. Honoré). Having succeeded Honoratus in the bishopric of Arles in 429, he set about the discharge of his episcopal functions with unusual energy and zeal. As bishop of Arles he held the rank of metropolitan of Vienne and Narbonne, and in this capacity he came in collision in 444 with Leo the Great on the question of the deposition of one of his bishops (Chelidonius); this quarrel resulted in his being deprived of his rights as metropolitan to consecrate bishops, call synods, or exercise ecclesiastical oversight in the province, and in the edict of Valentinian III., so important in the history of the Gallican Church. He died in 449, and his name was afterward introduced into the Roman martyrology for commemoration on May 5th.

HILARIUS, St., bishop of Pictavium (Poitiers), an eminent "doctor" of the Western Church, was born at Poitiers about the end of the third century A.D. His parents, who were pagans of distinction, afforded him every means of acquiring a good education; and to the ordinary accomplishments of an educated gentleman there was added in his case what had even then become somewhat rare in the West, some knowledge of Greek. After he had attained to manhood his attention was directed to the Old and New Testament writings, with the result that he became convinced of the truth of Christianity, and along with his wife and his daughter received the sacrament of baptism. About 353, although still a married man, he was by the unanimous voice elected bishop. At that time Arianism, which under imperial protection had overspread the Eastern, was now under similar auspices threatening also to overrun the Western Church; to resist and repel the irruption was the great task which Hilary now set himself to achieve. One of his first steps was to secure the excommunication by those of the Gallican hierarchy who still remained orthodox, of Saturninus, the Arian bishop of Arles, along with Ursacius and Valens, two of the most prominent of the supporters of that prelate. About the same time he wrote to the emperor Constantius a remonstrance against the persecutions by which the Arians had sought to crush their opponents. In 359 Hilary attended the convocation of bishops at Seleucia in Isauria, where, along with the Egyptian Athanasians, he joined the Homoiousian majority against the Arianizing party headed by Acacius of Cæsarea; thence he betook himself to Constantinople, and in a petition (*Ad Constantium Augustum Liber Secundus*) personally presented to the emperor in 360, repudiated the personal calumnies of his enemies and sought to vindicate his Trinitarian principles. The latter years of Hilary's life were spent in comparative quiet and retirement, devoted in part to the preparation of his expositions of the Psalms, for which he was largely indebted to Origen; of his *Commentarius in Evangelium Matthæi*, a work of no exegetical value; and of his no longer extant treatise on the book of Job. He died January 13, 368.

HILDA, or **HILDA** (614-680), usually called St. Hilda, a Saxon lady whose name is intimately associated with the history of the early English church and of early English literature. She was a member of the royal family of Northumbria, her father Hereric being a nephew of King Edwin; and, along with her royal kinsman, she received baptism at the hands of Paulinus. In 649, two years after her consecration as a nun, she was appointed to succeed Heru, the abbess of Heortea or Hartlepool. In 658 the abbess founded the famous monastery on the cliffs at Streonshalh or Whitby, and for the next twenty-two years she ruled with rare

ability and virtue over the double community of monks and nuns which gathered round her. Among those who shed the most abiding luster on the establishment were St. John of Beverley and the Saxon poet Caedmon. Hilda died in 680.

HILDBURGHAUSEN, the chief town of a circle in the duchy of Saxe-Meiningen, Germany, is situated in a wide and fruitful valley on the river Werra and on the Werra railway, nineteen miles southeast of Meiningen. Population 6,000.

HILDEBERT (HYDALBERT, GILDEBERT, ALDEBERT) of Le Mans and afterward of Tours, a prominent church leader, and one of the best Latin writers of his century, was born about 1055 at Lavardin near Vendôme, became a pupil of the famous Berengarius of Tours, archdeacon, and finally, in 1097, bishop of Le Mans. A dispute with Louis the Fat about the rights of ecclesiastical patronage brought him in to much disfavor with that monarch; but their mutual relations had much improved before the death of Hildebert, which took place on December 18, 1134. From some writers he has received the name of Saint, but his name occurs in no martyrology.

HILDEBRAND. See GREGORY VII.

HILDEBRANDSLIED. This invaluable example of Old German alliterative poetry is contained in a MS. originally belonging to the library of Fulda, and now preserved at Cassel. It is written on the first and last pages of a volume of Biblical and theological contents by two contemporary hands apparently belonging to the beginning of the ninth century. The conclusion of the poem is unfortunately wanting, evidently from want of space.

HILDEBRANDT, **EDUARD**, was born in 1817, at Dantzig. He was not twenty when he went to Berlin, where he was taken in hand by Wilhelm Krause, a painter of sea-pieces. Like other artists who have earned a name for subtle and rapid execution, he worked at first in a formal, smooth, and timid fashion. Several early pieces exhibited after his death,—a breakwater, dated 1838, ships in a breeze off Swinemünde (1840), and other canvases of this and the following year,—show Hildebrandt to have been a careful student of nature, with inborn talents kept down by the conventionalisms of the formal school to which Krause belonged. Hildebrandt died at Berlin on October 25, 1868.

HILDEBRANDT, **THEODORE** (born at Stettin, 1804, died at Düsseldorf 1874), was a disciple of the painter Schadow, and, on Schadow's appointment to the presidency of a new academy in the Rhenish provinces in 1828, followed that master to Düsseldorf. Bred in the academy of Berlin, and finished under Schadow (1820-24), Hildebrandt began by painting pictures illustrative of Goethe and Shakespeare; but in this form he followed the traditions of the stage rather than the laws of nature. The picture which made Hildebrandt's fame is the *Murder of the Children of King Edward*, of which the original, afterward frequently copied, still belongs to the Spiegel collection at Halberstadt. Comparatively late in life Hildebrandt tried his powers as an historical painter in pictures representing Wolsey and Henry VIII., but he lapsed again into the romantic in Othello and Desdemona, a fair replica of which, in Schulte's collection at Düsseldorf, gives a good idea of his shiny, ineffective, technical execution. After 1847 Hildebrandt gave himself up to portrait painting, and in that branch succeeded in obtaining a large practice.

HILDEGARD, commonly referred to as St. Hildegard, abbess, "prophetess," and a figure of some consequence in the history of mediæval mysticism, was born at Bückheim, diocese of Mainz, in 1098 (or 1099.)

From earliest childhood, we learn from Hildegard herself, she was accustomed to see visions which increased in frequency and vividness as she approached the age of womanhood; these, however, she for many years, though with great pain, kept almost wholly secret, nor was it until she had reached her forty-third year (1141) that she felt constrained at last to divulge them. Committed to writing by her intimate friend the monk Godefridus, they now form the first and most important of her printed works, entitled *Scivias*. Among her correspondents were Popes Anastasius IV. and Hadrian IV., the emperors Conrad III. and Frederick I., and also the theologian Guibert of Gembloux, who submitted numerous questions in dogmatics for her determination.

HILDEN, a town of Prussia, in the government and circle of Düsseldorf, on the Itterbach. It is a station on the Rhenish railway, and has a considerable manufacture of silks, both pure and mixed, calico, and machinery; it also possesses a deaconess institute. Population, 7,500.

HILDESHEIM, the chief town of a district in the province of Hanover, Prussia, is beautifully situated on the right bank of the Innerste, eighteen miles south-east of Hanover by railway. It has a very antique and quaint appearance, and is surrounded by old ramparts which have been converted into shady alleys and promenades. The streets are for the most part narrow and irregular and contain many old houses with overhanging upper stories and richly and curiously adorned wooden façades. The town is the seat of a district governorship, a high court of justice, two justice courts, a general superintendency of the Evangelical Church, and a Roman Catholic chapter. The Catholic cathedral, which occupies the site of a building founded by Louis the Pious in 818, dates from the middle of the eleventh century. It is chiefly remarkable for the antiquities and notable works of art connected with it. The town has iron foundries, manufactures of cloth, damasks, linen fabrics, thread, sail-cloth, wadding, leather, machines, carriages, stoves, glass, tobacco, alcohol, perfumeries, chocolate, and starch. The population is 23,000.

HILDRETH, RICHARD, an American journalist and author, was born at Deerfield, Mass., June 28, 1807. He was educated at Harvard College, where he graduated in 1826; and after studying law at Newburyport, he was called to the Boston bar in 1830. In 1832 he became joint founder and editor of a daily newspaper, the *Boston Atlas*. Having in 1834 gone to the south for the benefit of his health, he was led by what he witnessed of the evils of slavery to write the anti-slavery novel *Archy Moore*, which, chiefly on account of its subject, met with considerable success in America and England. An enlarged edition appeared of it in 1852 under the title of the *White Slave*. In 1837 he wrote *Banks, Banking and Paper Currency*, a work which had some influence in fostering the growth of the free banking system in America. In 1838 he resumed his editorial duties on the *Atlas*, but in 1840 he found it necessary, on account of his health, to remove to British Guiana, where he was editor of two weekly newspapers in succession at Georgetown. He published in the same year *Despotism in America*, and he also made the columns of his newspapers the medium for the dissemination of anti-slavery opinions. In 1849 he published the first three volumes of a *History of the United States*, a work which, if its narrative is rather bald and tame, is characterized by perfect fairness and candor, and displays great industry and care in the representation of facts. Other three volumes, completing the work, appeared in 1855. His *Japan as it was and is* is a valu-

able digest of the information contained in other works on that country. He also wrote *Theory of Morals* (1844), and *Theory of Politics* (1853), as well as *Lives of Atrocious Judges*, compiled from Lord Campbell's two works. For some time Hildreth was on the editorial staff of the *New York Tribune*, and he was also a frequent contributor to periodicals. In 1861 he was appointed United States consul at Trieste, but ill health compelled him to resign his office and remove to Florence, where he died July 21, 1865.

HILL, AARON (1685–1749 or 1750), an English poet and miscellaneous writer, was born in London, February 10, 1685, and died about 1750.

HILL, MATTHEW DAVENPORT, was born August 6, 1792, at Birmingham. He was called to the bar in 1819. In 1832 he was elected one of the Liberal members for Kingston-upon-Hull, but he lost his seat at the next election in 1834. On the incorporation of Birmingham in 1839 he was chosen recorder; and in 1851 he was appointed commissioner in bankruptcy for the Bristol district. Hill was one of the chief promoters of the Society for the Diffusion of Useful Knowledge, and the originator of the *Penny Magazine*. He died June 7, 1872.

HILL, ROWLAND, an eccentric and popular English preacher, was born at Hawkstone, England, August, 23, 1744. After receiving his early education at the grammar school of Shrewsbury and at Eton, he in 1764 entered St. John's College, Cambridge. While at the university he made the acquaintance of the Methodist preacher Whitfield, and stimulated by his example he somewhat scandalized the university authorities and his own friends by preaching, before he had obtained holy orders, in the surrounding villages, and conducting religious services in the houses of the sick and poor. After graduating with distinction he took orders, and in 1773 was appointed to the parish of Kingston, Somersetshire, where he began to indulge his favorite taste for open air preaching, and soon attracted great crowds to the services which he held nearly every day of the week. Having on the death of his father in 1780 inherited considerable property, he built for his own use Surrey Chapel, in the Blackfriars Road, London. The chapel was opened on June 8, 1783. Though now practically occupying the ecclesiastical position of a dissenter, Hill conducted his services in accordance with the forms of the Church of England, in whose communion he always remained. From the beginning his success was complete, and his chapel soon came to be filled with an audience such as no other preacher in London could boast. During the summer months he made what he called "gospel-tours" in all parts of the country, sometimes extending them to Scotland and Ireland, and attracted wherever he went audiences as numerous and as interested as those which had crowded to hear Whitfield. After these tours he always returned with increased enthusiasm to his duties at Surrey Chapel, where he continued to officiate almost to the day of his death, April 11, 1833. The oratory of Rowland Hill, like that of Whitfield, was specially adapted for rude and uncultivated audiences, and it was equally effective.

HILL, SIR ROWLAND, originator of the penny postal system, a younger brother of Matthew Davenport Hill, was born December 3, 1795, at Kidderminster. After his marriage in 1827 Hill taught school at Bruce Castle, Tottenham, which he conducted until failing health compelled him to retire in 1833. About this time he became secretary of Gibbon Wakefield's scheme for colonizing South Australia, the objects of which he explained in 1832 in a pamphlet on *Home Colonies*, afterward partly reprinted during the Irish famine under the title *Home Colonies for Ireland*. It was in 1835

that his zeal as an administrative reformer was first directed to the postal system. After a laborious collection of statistics he succeeded in satisfying himself and in demonstrating to the world that the principal expense of a letter carriage was in receiving and distributing, and that the cost of conveyance differed so little with the distance that a uniform rate of postage was in reality the fairest to all parties that could be adopted. Trusting also that the deficiency in the postal rate would be made up by the immense increase of correspondence, and by the saving which would be obtained from prepayment, from improved methods of keeping accounts, and from lessening the expense of distribution, he in his famous pamphlet published in 1857 recommended that within the United Kingdom the rate for letters not exceeding half an ounce in weight should be only one penny. So great became the pressure of public opinion against the opposition offered to the measure by official prepossessions and prejudices that in 1838 the House of Commons appointed a committee to examine the subject. The committee having reported favorably, a bill to carry out Hill's recommendations was brought in by the Government. The Act received the royal assent in 1839, and after an intermediate rate of fourpence had been in operation from December 5th of that year, the penny rate commenced January 10, 1840. Hill received an appointment in the Treasury in order to superintend the introduction of his reforms, but he was compelled to retire when the Liberal Government resigned office in 1841. In consideration of the loss he thus sustained, and to mark the public appreciation of his services, he was in 1846 presented with the sum of £13,360. On the Liberals returning to office in the same year he was appointed secretary to the postmaster-general, and in 1854 he was made chief secretary. In 1860 his services were rewarded with the honor of knighthood; and when failing health compelled him to resign his office in 1864, he received from parliament a grant of £20,000, and was also allowed to retain his full salary of £2,000 a year as retiring pension. In 1864 the university of Oxford conferred on him the degree of D.C.L., and on June 6, 1879, he was presented with the freedom of the city of London. He died August 27th following, and was buried at Westminster Abbey.

HILL, Viscount. Rowland Hill, nephew of the Rev. Rowland Hill, was born at Prees, Shropshire, August 11, 1772. After receiving his early education at Ighitefield and Chester, he was gazetted to the 38th regiment. In the beginning of 1793 he raised an independent company, and was promoted to the rank of captain. The same year he distinguished himself in the siege of Toulon; and after serving some time on the continent he in 1797 set out as colonel of the 90th regiment with Sir Ralph Abercromby's expedition to Egypt, where he acquired great distinction, and was wounded at the battle of Alexandria. Having in 1803 been gazetted brigadier-general, he in 1808 accompanied Sir Arthur Wellesley to Spain, and from Vimiera to Vittoria, in advance or retreat, he proved himself the most indefatigable coadjutor of the great captain. In 1809 he was gazetted lieutenant-general, and in the following year was appointed to the independent command of the second army corps of Wellington in Portugal; in 1811 he annihilated the French army under Girard at Arroyomolinos (Caceres), in recognition of which he received the order of the Bath; and for his capture of the forts of Almaraz, which cut off the communication between the French armies on the north and south sides of the Tagus, he was in 1814 rewarded with the title of Baron Hill of Almaraz. In 1813 he held temporarily the command of the English and Hanoverian troops in Belgium, and two years later crowned the glories of his noble

career by his conduct at Waterloo, where he was at the head of the brigade which resisted and repulsed the last effort made in behalf of the French by the imperial guard. When Wellington became premier in 1828, Hill received the appointment of general commanding-in-chief, and on resigning this office in 1842, he was created a viscount. He died on December 10th of the same year.

HILLAH, a town of Asiatic Turkey in the pashalik of Baghdad. It is picturesquely situated, in the midst of a very fertile district, on both banks of the Euphrates, which are connected there by a floating bridge 450 feet in length. Population, 10,000.

HILLARD, GEORGE STILLMAN, an American author, was born at Machias, State of Maine, September 22, 1808. After graduating at Harvard College in 1828, he became joint rector of the Round Hill Seminary at Northampton. In 1833 he was called to the Boston bar. He was chosen a member of the common council of Boston in 1845, and he was for six months its president. In 1849 he was elected a member of the state legislature. The engrossing character of his professional and other engagements did not, however, prevent him from devoting a large portion of his time to literature. Besides editing successively the *Christian Register* (a Unitarian paper), *The Jurist*, and the *Boston Courier*, he published an edition of Spenser's works (in 5 vols., 1839), and a selection from the works of Walter Savage Landor (1856), and wrote *Six Months in Italy* (2 vols., 1833), *Life and Campaigns of George B. McClellan* (1865), a series of school-books which have met with wide acceptance, and various articles in periodicals and encyclopedias. From 1867 to 1878 he was United States district attorney for Massachusetts. He died January 27, 1879.

HILLEL, a famous Jewish rabbi, sometimes called for distinction's sake "the elder" or "the old," flourished about the time of Herod the Great. According to the Talmudists, he was born of a poor Davidic family, at Babylon, apparently about the year 75 B. C.

HILLER, JOHANN ADAM (1728-1804), musical composer, was born at Wendisch-Ossig, near Görlitz in Silesia, December 25, 1728, and died June 16, 1804.

HILL TIPPERAH, a native state adjoining the British district of Tipperah, Bengal, with an area of about 4,086 square miles, and population 137,442. It is bounded on the north by the Assam district of Sylhet, on the west by the Bengal districts of Tipperah and Noakáhlí, on the south by Noakáhlí and Chittagong districts, and on the east by the Lushai country and the Chittagong Hill Tracts. As its name implies the country is hilly. Five or six ranges of hills run parallel from north to south, at an average distance of about twelve miles from each other. The hills are covered for the most part with bamboo jungle, while the low ground abounds with trees of various kinds, canebrakes, and swamps. The principal ranges are, beginning from the east, the Jám-pui, Sakkankhang, Langtarái, and Atháramurá. The chief rivers are the Gumti, Háorá, Khozái, Dulái, Manu, and Phení. During the heavy rains, the people in the plains use boats, as almost the sole means of conveyance. The forests give shelter to numbers of wild elephants and other large game. Small game of various kinds are met with.

HILTON, WILLIAM, English painter, was born in Lincoln, June 3, 1786, son of a portrait painter. In 1814, having exhibited Miranda and Ferdinand with the Logs of Wood, he was elected an associate of the Academy, and in 1820 a full academician, his diploma-picture representing Ganymede. He died in 1839.

HILVERSUM, a village and commune in the

Netherlands in the province of North Holland, about equally distant from Amsterdam, Utrecht and Amersfoort, with all of which it is connected by railway. Population about 7,000.

HIMALAYA is the name given to the mountains which form the northern boundary of British India, between the 75th and 95th meridians east of Greenwich. The word is Sanskrit, and literally signifies "snow-abode."

Although the term Himalaya is applied by the natives of India only to the ranges which they see covered with perpetual snow, it has been long used by European geographers to designate the whole mountain region for which the Indian has no other name than *pāhār*, i.e., "the mountains," of which the snowy ranges constitute but a small portion. The first mere cursory examination of these mountains by the older geographers rightly convinced them of the general physical unity of the mountainous region to the north of India, which in length extends from about 72° to 95° E. long., that is, between the rivers Indus and Brahmaputra, and in breadth includes the ranges between the plains of Hindustan and the upper parts of the main branches of these two great rivers. To these ranges the designation of Himalaya has by degrees been specially attached; and there is a certain convenience in still restricting the name to that part of the mountains which is accessible from British India, for this is the practical signification of it now commonly accepted.

Scientific investigation has clearly shown that, so far as the main characteristics of the mountains are concerned, the natural boundaries of the Himalayan system must be carried much further than had at first been recognized. Considerable obscurity still involves the eastern portion of these mountains, and there is great want of precise knowledge as to their connection with the ranges of western China, from which are thrown off the great rivers of China, Siam, and Burmah. On the west however, it has been completely established that a continuous chain extends beyond the Indus along the north of the Oxus, and ends in that quarter about 68° E. longitude. In like manner it is found that no separation can be established, except a purely arbitrary one, between the Himalaya as commonly defined and the greatly elevated and rugged table-land of Tibet; nor between this last and the mountain ranges which form its northern border along the low-lying desert regions of Central Asia.

It thus appears that the Himalaya, with its prolongation west of the Indus, constitutes in reality the broad mountainous slope which descends from the southern border of the great Tibetan table-land to the lower levels of Hindustan and the plains of the Caspian; and that a somewhat similar mountain face, descending from the northern edge of the table-land, leads to another great plain on the north, extending far to the eastward, to the northern borders of China. Toward its north-west extremity this great system is connected with other mountains—on the south, with those of Afghanistan, of which the Hindu-Kush is the crest, occupying a breadth of about 250 miles between Peshāwur and Kūndūz; and on the north, with the mountains that flank the Jaxartes or Sir on the north, and the Thian-shan or Celestial Mountains. The eastern margin of Tibet descends to western China, and the southeastern termination of the Himalaya is fused into the ranges which run north and south between the 95th and 100th meridians, and separate the rivers of Burmah, Siam and western China.

The average level of the Tibetan table-land may be taken at about 15,000 feet above the sea. The loftiest points known on the earth's surface are to be found

along its southern or Himalaya boundary; one of them falls very little short of 30,000 feet in elevation, and peaks of 20,000 feet abound along the entire chain. The plains of India which skirt the Himalayan face of the table-land, for a length of rather more than 1,500 miles, along the northern border of British India, nowhere rise so much as 1,000 feet above the sea, the average being much less. The low lands on the north, about Kashgar and Yarkend, have an elevation of from 3,000 to 4,000 feet, and no part of the Central Asiatic desert seems to fall below 2,000 feet, the lake of Lob-nor being somewhat above that level. The greatest dimension of the Tibetan mountain area from east to west may be about 2,000 miles, while its average breadth somewhat exceeds 500 miles; about 100 miles on either side constitute the sloping faces, the central table-land having a width of about 200 miles on the west and probably 500 miles at its eastern border.

The southern portion of the Tibetan table-land throws off its waters to the northwest and southeast from a central line almost on 82° E. longitude, the Indus flowing in the former direction, and the Brahmaputra in the latter. These two rivers maintain their courses for a great distance in opposite ways, longitudinally, along the summit of the table-land; they receive as they proceed the drainage of a large portion of its surface; and their accumulated waters are at length discharged by two openings in the Himalayan slope across the plains of Hindustan into the Indian Ocean.

The northern provinces of British India occupy the great plain which flanks the Himalaya on the south, along its whole extent from the issue of the Brahmaputra on the east to the ranges that lie along the Indus. The whole tract, excepting Assam, i.e., the valley of the Brahmaputra, is highly cultivated and populous; and with the same exception the population throughout is of the race known as Aryan, being almost exclusively Hindu in religion on the east, but passing into Mahometan on the west.

The most eastern portion of the Himalayan mountain slope, as far as the 92d meridian, is occupied by wild tribes of which, or of the country they occupy, little is known. They are in small communities under petty chiefs, and their languages, which vary considerably in detail, are to some extent allied to Tibetan and monosyllabic. Between the 92d and 80th meridians is the small state of Bhotān, the local name of which is "Lhopato." It approximates in language, customs and religion to Tibet proper, and its government is carried on by two separate chiefs, temporal and spiritual. Its northern border, where it is met by Tibet, lies along the 28th degree of north latitude. The small British district of Sikim succeeds, occupying the lower part of the basin of the Tista river, and having Darjeeling as its chief settlement. The native state of Sikim, in Tibetan called "Demojong," extends north of British Sikim to Tibet; it is almost as Tibetan as Bhotan, and still less important. Its western border falls nearly on the 88th meridian.

From the 88th nearly to the 80th meridian the whole southern slope is occupied by the kingdom of Nepāl, which since the wars with the British in 1814-16 has retained complete independence.

The Kāli or Sārda river forms the boundary between Nepāl and the British provinces of Kumaon and Garhwāl, the chief town in which is almora, and which occupy the entire mountain face, from the watershed to the plains, as far as the main stream of the Ganges, for a distance from east to west of about 100 miles. Thence, an equal distance brings us to the Sutlej, the intermediate tract being occupied by many small principalities, independent, in their civil government,

but entirely under political control of the British. In this region is situated Simla, the summer capital of the government of British India, on one of the outer ranges overlooking the Sutlej. Other small districts and principalities, partly British, occupy the Himalayan slope as far as the 76th meridian.

The population of the whole of the mountain districts west of Nepál maintains to a great extent its Hindu type, though the Mahometan religion gradually becomes more prevalent as we approach the Indus, where it is found to have superseded Hinduism. In the more remote and elevated valleys an infusion of Tibetan race, religion, and language is found, diminishing as we pass to the west; but otherwise the dialects spoken are everywhere Prakritic, and closely allied to Hindi. As a rule the people are short in stature, muscular, as is common among mountaineers, fairer than the inhabitants of the plains, and in the western regions, where the Hindu or Aryan stock prevails, women of remarkable beauty are often seen. At the lower altitudes cotton clothing is usual, at the greater elevations hempen and woolen materials prevail, but an utter disregard of personal cleanliness is universal. Goitre is frequent in both sexes, and cretinism seems to occur much in the European form.

The eastern ranges are wetter, the climate generally warmer and more equable, and the vegetation more rank and of a more tropical character; the mountains are more copiously covered with forest, and the extent of cultivation is less, and the population probably less also. To the west, with a drier atmosphere and greater variations of temperature, the climate above 5,000 or 6,000 feet becomes more like that of southern Europe, and the main features of the scenery become more conspicuously similar to those of European mountains. On the east the customs of the people differ little from those of the neighboring Tibetan or semi-Tibetan provinces. On the west there is no great distinction between the people of the hills and of the plains in their customs, agriculture, or other occupations.

The summit of the table-land from the borders of China to the 75th meridian, where the Indus suddenly turns off to the south, is comprised in Tibet, or as it is called in the language of its inhabitants "Bod" or "Bodyul," the latter word being equivalent to "Bod-land." Of the eastern half of Tibet very little is known, and that little chiefly relates to the most southern portion which borders on the Himalaya, and the most eastern which abuts on China. The table-land here has its greatest development, and is perhaps as much as 500 miles from north to south. At its northwestern end its breadth is reduced to something under 200 miles. The extreme cold and drought make Tibet essentially poor; and the character of its inhabitants approaches that of the denizens of the Arctic regions, who live under somewhat similar physical conditions. The people are broadly built, with a strongly-marked Mongolian physiognomy, dark hair, little or no beard, oblique eyes, and prominent cheek bones. In the warmer valleys they are mainly agricultural, and live in houses; in the higher regions they are shepherds, living in tents, thinly scattered over a large area.

To the west of Tibet the mountains are prolonged to the 70th meridian at an elevation not greatly less than that which prevails eastward, and the table-land there ends in the region known as Pamir, which has all the characteristics of the higher parts of Tibet. Beyond this we pass into Turkestan and reach the limits by which the scope of the present article is restricted.

The great plain of northern India stretches with an almost unbroken surface along the foot of the Himalaya

from the upper Indus to the head of the delta of the Ganges, and thence has a narrow prolongation along the Brahmaputra up the valley of Assam. Including its extensions to the sea, along the Indus on the west, and along the Ganges on the east, its area is about 500,000 square miles. It nowhere rises to more than 1,000 feet above the sea level, and to the unassisted eye it appears a perfectly dead flat. That part of the plain which lies along the foot of the mountains, and more particularly the central and eastern portion, is well watered, being intersected by the numerous streams that flow from the mountains, and under the full influence of the periodical rains, and it comprises the best cultivated, the richest, the most populous, and most civilized districts of India.

The transition from the plains to the mountains is sudden and well-defined along a line that is almost continuous. The ranges to which geologists have given the name of "Siwálík," and "sub-Himalayan", rise abruptly, and without any intermediate undulating ground from the apparently level surface of the plain. These hills, which from recent geological investigation we learn to be formed of deposits of various periods of the Tertiary epoch, attain elevations from a few hundred to 3,000 or 4,000 feet.

The sub-Himalayan ranges have a well-defined distinct geographical existence along the greater part of the chain, and their geological continuity is established where no valley is formed between them and the inner ranges, and where they cannot be otherwise distinguished from the general mass of mountains.

The ranges which lie immediately within the external band of the Siwálíks, or sub-Himalaya, rise abruptly above it to much greater elevations; and constitute the first masses which in such a region we can with propriety dignify with the name of mountains. Their ordinary elevation is about 7,000 feet, and the highest summits on them reach 8,000 or 9,000 feet above the sea. It is on them that sanitary stations have been established for the convenience of the European residents in the neighboring provinces of India, as affording the nearest sites to the plains at which a temperate climate can be reached.

The highest known peak in the Himalaya, and indeed in the world, is that in Nepál known as Mount Everest, which rises to 29,002 feet. Kinchinjinga in Sikim, on the east, reaches 28,156 feet, and another peak more recently measured, in the extreme west, reaches 28,278 feet. Dháwalagiri, in Nepál, is stated to be 26,826 feet, and Nandadevi, in Kumaon, to be 25,700 feet above the sea. But many other points have been measured exceeding 25,000 feet in elevation, two of which are to the north of Kumaon; and the enumeration of all known peaks over 20,000 feet would be wearisome. These statements have reference to the particular zone along the Indian watershed above described, beyond which, as was before said, few measurements have been made (excepting in Ladák), but there is every reason to believe, from such scanty facts as are available for forming an opinion, that mountains rising considerably above 20,000 feet are of frequent occurrence throughout Tibet.

HIMERA, a city on the north coast of Sicily. It was founded in 648 B.C. by the Chalcidian inhabitants of Zancle, but with them were many Syracusan exiles, who gave to the language of the city a Doric character. It seems to have enjoyed great prosperity during the fifth century. In 415 it refused to admit the Athenian fleet, and was a zealous ally of Syracuse. In 408 the Carthaginians sent another great army, under Hannibal, grandson of Hamilcar, who razed the city to the ground.

HUMMEL, FREDERICK HENRY (1765-1814), a Ger

man composer, was born November 20, 1765, at Treuenbrietzen, in Brandenburg, Prussia, and originally studied theology at Halle. He died at Berlin, June 8, 1814.

HINCKLEY, a market town of England, county of Leicester, is situated thirteen miles southwest of Leicester, on a branch line between that town and Nuneaton, which connects the London and Northwestern and the Midland railways. Population, 7,000.

HINCMAR (c. 806-882), archbishop of Rheims from 845 to 882, a prominent figure in most of the theological and ecclesiastical struggles of his day, and perhaps the most vigorous and influential prelate France has ever produced, belonged to a noble West Frankish family, and was born about the year 806, and died in 882.

HINDLEY, a manufacturing town of Lancashire, is situated on the Lancashire and Yorkshire railway, three miles southeast of Wigan. Cotton-spinning and the manufacture of cotton goods are the principal industries, and there are extensive coal-mines in the neighborhood. Population, 12,000.

HINDOL, one of the tributary states of Orissa, India. It is surrounded on all sides by native states, being bounded on the north and east by Dhenkál, on the south by Barambá and Narsinhpur, and on the west by Angul. Area, 312 square miles. Population, about 30,000.

HINDÚ KÚSH is a title applied to the line of alpine watershed stretching west-southwest from the southern margin of Pamir, the Caucasus of Alexander's historians, which divides Afghanistan in a general sense from Afghan Turkestan, and the basin of the Cabul river from the basin of the Oxus. Looking toward the heart of a map of Asia, the eye is caught by that remarkable point where the great highland seems clenched as it were to a knot, whence expand in different directions (1) to east and southeast the great Tibetan plateau, (2) to north that of Pamir, and (3) to west that of Khorasan and Persia. Between the diverging masses run up the great basins of the Indus, the Yarkand river, and the Oxus. Some dim memory of these great features perhaps, transformed and transplanted further east, appears in the cosmography of the Puranas, in which the mythical Ganges falling on Mount Meru divides into four great rivers flowing to the cardinal points.

This is the first impression. But, imperfectly as we yet know the mountain structure, the more we learn the more evanescent becomes this idea of triplicity as typifying the true skeleton. This node is in fact the place of contact or intersection of two great elevations:—(1) of the Himalaya, of which the axial lines approach in a direction southeast to northwest; and (2) of the Thian-Shan and allied ranges, of which the axial lines run from east-northeast to west-southwest. The parallelism of Hindú Kúsh seems to attach it to the latter system.

The definition of geographical features must often be in part arbitrary, but that of Hindú Kúsh fairly coincides with natural limits. On the east we take it as commencing at the Baroghil Pass, leading from the high valley of Little Pamir south into the valley of Káshgár or Chitral. Just east of this is a cluster of peaks of great altitude, but their alignment attaches them to the great Gilgit range of the Himalaya. On the west we regard Hindú Kúsh as including and terminating at the Hajjigak Passes, those most commonly used between Cabul and Turkestan. West of this the range continues as a watershed of considerable altitude, but with a partial change of direction and loss of true alpine character. In maps this prolongation is styled Koh-i-Baba. Properly Koh-i-Baba is the name of a conspicuous three-peaked mountain rising over the Hajjigak Pass, to a height of at least 16,500 feet, which we regard as the terminal prominence of Hindú Kúsh,

though it is in truth also isolated from the higher summits to the eastward, which especially claim that name, by a considerable interval of tamer mountain, rounded and naked.

The total length of Hindú Kúsh as thus defined is 365 miles. Toward the eastern extremity the watershed perhaps emerges little from the table-land, for the Baroghil Pass is of singularly easy acclivity on both sides, and no prominent summits adjoin it on the west. But for the rest of its extent the mountain tract of Hindú Kúsh realizes the popular idea of an alpine chain, i.e., of an unpierced mountain barrier whose passes are never far below the line of perpetual snow, and whose highest peaks are never very far from the watershed.

The general altitude of the "cols" or passes runs from 12,000 to 13,000 feet.

HINDUR, also called **NALAGARH**, one of the Punjab hill states, under the government of the Punjab, India. Area, 256 square miles. The country was overrun by the Ghoorkas for some years prior to 1815, when they were driven out by the British, and the rájá confirmed in possession of the territories. The estimated population is 70,000. The principal products are opium and the usual grains.

HINDUSTAN. See **INDIA**.

HINDUSTANI, or **URDU**, is a dialect of the Hindí, one of the seven languages of Aryan stock spoken at the present day in North India, the others being the Panjabi, Sindhi, Gujarati, Maráthi, Bangali, and Oriyá. The area over which it is spoken in North India may be said to be coëxtensive with that of the Hindí, which is estimated at about 250,000 square miles extending from the river Gandak in the east to the Sutlej in the west, and from the Himalaya in the north to the Vindhya mountains in the south. It is also extensively used, though in a somewhat different phase, in a great part of the Deccan, and is moreover the *lingua franca* of most parts of India.

As the Hindí language consists of many dialects, it is necessary to state that it is the Braj Bhāshā, or the dialect that is spoken in the districts of Agra and Mathura, and in the neighborhood of Dehli, the ancient capital of the Mohametan empire, which is generally regarded as the parent of Hindústānī. The grammatical structure and also a vast number of the commonest vocables of the Braj were incorporated in the new dialect, and to these were added a vast number of Persian, Arabic, and even Turkish words. Such words, however, in no wise altered or influenced the language itself, which, as regards its inflectional or phonetic elements, remains still a pure Aryan dialect, just as pure in the pages of Wali or Saudā, as it is in those of Tulsi Dās or Bihārī Lāl.

As regards the introduction of foreign words into the various dialects of Hindí, it seems highly probable that it had its origin at an early period, perhaps as early as the eighth or ninth century of our era. But there is good ground for the opinion that, although the Hindí area was overrun as early as the twelfth century, the Hindústānī was not formed till the sixteenth century. For many generations after the victories of Kutbu'd-din Aibak, the first Musalmán sovereign of Dehli, the conquerors retained their own Persian, and the conquered their Hindí. The Musalmāns had long been accustomed to speak pure Hindí, and it was not they who introduced Persian words into the language, but the Hindús themselves, who at the epoch above mentioned were compelled by Todar Mal's new revenue system to learn Persian. And we learn from Mír Amman of Dehli (whose brief account of the origin of Urdū in the preface to his well-known *Bāgh-o-Bahār* bears on the face of it every convincing mark of probability, and,

scanty as it is, is remarkable as, perhaps, the only attempt at a critical disquisition in the whole range of Hindustani literature) that at the date of the composition of his work (1802) the Musalmān dynasties had endured for a thousand years, and that as intercourse increased the languages of the Hindus and Musalmāns became to a certain extent mixed.

The epoch of Akbar, which first saw a regular revenue system established, with toleration and the free use of their religion granted to the Hindus, was, there can be little doubt, the period of the formation of the language. But its final consolidation did not take place till the reign of Shah Jahān. After the date of this monarch the changes are comparatively immaterial until we come to the time when European sources began to mingle with those of the East. Of the contributions from these sources there is little to say. Like the greater part of those from the Arabic and Persian, they are chiefly nouns, and may be regarded rather as excrescences which have sprung up casually and have attached themselves to the original trunk than ingredients duly incorporated in the body.

The grammatical structure of the Hindustani differs in no essential particular from that of the Hindi from which it is sprung. Of the history and development of the Hindi or Hindū language previous to the eleventh century of our era little or nothing is known. It is accepted as a fact by most scholars that Sanskrit ceased to be a vernacular in the sixth century B.C., when the Buddhist religion was founded, which for ten centuries drove Brāhmanism into obscurity. From that time the Aryan people of India spoke popular dialects called Prākritis, and it is from these that time modern Aryan tongues are mainly derived. The dawn of modern Hindi may be dated from the eleventh century. The earliest known writer in the language was Chand Bardāi (c. 1200), whose epic is in a dialect rude and half-formed, but as decidedly analytical as the Hindi of the present day. Much of the old synthetical structure no doubt is still to be found in the work; the particles and auxiliary verbs are in a very crude and uninformed state; but these crudities and remnants of old Prākrit forms do not affect the general structure.

HINDUSTANI LITERATURE. Hindustani literature falls into two great divisions, of which the first is comprehensively styled Hindi, the second Urdu. Both of these forms of speech are, in their application to literary purposes, at first intruders upon the ground already occupied by the learned languages, Sanskrit and Persian. At no time during modern Indian history has Sanskrit altogether ceased to be used for composition by the class who regard culture and literature as their special heritage, although during the last two centuries it has much fallen from its former estate; and Persian has been still less neglected by learned Muhammadans and their Hindu imitators in India. But there is this difference between them that, whereas Hindi has been raised to the dignity of a literary language chiefly by impulses of revolt against the monopoly of the Brahmins, Urdu has been cultivated with good will by authors who have themselves highly valued and dexterously used the polished Persian. Both, however, represent the popular side of the national culture, and in the present day they are almost in sole possession of the field. The subject may be divided as follows:

Early Hindi, of the period during which the language was being fashioned as a literary medium, represented by the old heroic poems of Rājapitānā and the literature of the *Bhagats* or Vaishnava reformers, and extending from about 1200 to 1570 A.D.

Middle Hindi, representing the best age of Hindi poetry, and reaching from about 1570 to 1750 A.D.

The rise and development of literary Urdu, beginning about the end of the sixteenth century and reaching its height during the eighteenth.

The modern period, marked by the growth of a prose literature in both dialects, and dating from the beginning of the present century.

Early Hindi literature has as yet been very insufficiently explored.

The *origines* of Urdu as a literary language are extremely obscure. The popular account refers its rise to the time of Timūr (1398). Some authors even claim for it a higher antiquity, asserting that a *divān* or collection of poems, was composed in *Rekhtah* by Mas'ūd, son of Sa'd, in the last half of the eleventh and beginning of the twelfth century, and that Sa'di of Shirāz and his friend Amir Khusrao of Delhi likewise made verses in that dialect before the end of the thirteenth century. This, however, is very questionable; and the better opinion appears to be that these ancient compositions, if they existed at all, were written in Hindi according to the metrical forms of that language, rather than in what is properly called Urdu. That Muhammadans composed in Hindi, and used that language as their vernacular, is certain; and in many passages of Kabīr, which are nevertheless pure Hindi compositions, Persian words are used almost as freely as in the modern dialect. Much of the confusion which besets the subject is due to the want of a clear definition of what Urdu, as opposed to Hindi, really is.

Urdu, as a literary language, differs from Hindi rather in its form than in its substance. The really vital point of difference, that in which Hindi and Urdu are incommensurable, is the prosody.

The whole of Urdu poetry follows Persian models of composition; its themes are those which had already been worked (some might say, worked out) by writers in that language; and neither in form nor substance do we find the faintest flavor of originality from its commencement to the present day.

The paucity of themes and the want of originality in the Urdu verse have led to a most elaborate development of the system of rhetoric. Where the substance of what a poet has to say is identical with that which has been said by hundreds, nay thousands of poets before him, it is of the highest importance that the way of saying it shall if possible be peculiar to himself. Rhetoric, accordingly, rather than poetic feeling, is the distinguishing feature of composition in Urdu.

Printing was first used for vernacular works by the College Press at Fort William, and all the compositions prepared for Doctor Gilchrist and his successors which have been already mentioned were thus made public; but the expense of this method of reproduction long precluded its extensive use in India, and the ungraceful characters used as types were not appreciated by the natives. In 1837 the first lithographic press was set up at Delhi, and from that date onward the publications, original or editions of older works, issued in this shape annually may be counted by hundreds. The newspaper press soon followed the introduction of lithography, and there are at present about two hundred journals in Urdu and Hindi printed in India, the majority in the Northwestern Provinces, the Panjāb, and Oudh, but a few at Madras, Haidarābād, Bangalore, Bombay, and Calcutta. The extension of vernacular literature during the last thirty years is enormous, and to describe it adequately would require a volume.

English education has naturally had a vast influence on modern vernacular literature, though not wholly a beneficial one. More than a half of the new works issued within the last thirty years are translations or adaptations from English; the journals, the great popu-

larizers of new ideas, take their matter chiefly from English newspapers; the courts, where Urdū has since 1832 become the official language, contribute to the spread of the stiff and difficult phraseology of the Acts of the legislature, as different from the natural idiom of the people as can well be imagined.

HINGANGHĀT, a town in the Wardha district, Central Provinces, India, twenty-one miles southwest of Wardha, with a population of 9,415. It is a main seat of the cotton trade, the Hinganghāt cotton produced in the rich Wardha valley being esteemed one of the best indigenous staples of India.

HINOJOSA DEL DUQUE, a town of Spain, in the province of Cordova, from which city it is distant about fifty-eight miles north by west. The manufacture of linens and woolens is carried on to some extent. Population, 8,500.

HINTON, JAMES, aural surgeon and author, son of John Howard Hinton, Baptist minister and author of the *History and Topography of the United States* and other works, was born at Reading, England, in 1822. He was educated at his grandfather's school near Oxford, and at the Nonconformist school at Harpenden. After receiving his diploma in 1847, he was for some time assistant surgeon at Newport, Essex, but the same year he went out to Sierra Leone to take medical charge of the free laborers on their voyage thence to Jamaica. After his return to England in 1850, he entered into partnership with a surgeon in London, where he soon had his interest awakened specially in aural surgery, and gave also much of his attention to physiology and to problems bearing on the relation between mind and body. He made his first appearance as an author in 1856 by contributing a series of papers on physiological and ethical subjects to the *Christian Spectator*. In 1863 he obtained the appointment of aural surgeon to Guy's Hospital, after which he speedily acquired a lucrative west-end practice, and wrote *An Atlas of Diseases of the Membrana Tympani and Questions of Aural Surgery*, which are regarded as the chief authorities in this branch of surgery. He died December 16, 1875.

HIOGO, or **FIOGO**, a seaport town of Japan, in the island of Nipon and province of Setsu, on the western shore of the Idzumi Sea, or Bay of Osaka, about forty miles southwest of Kioto, with which it has had railway communication since 1874. It was opened to foreign commerce in 1860, and since that date it has risen with the maritime suburb of Kobe (the Gate of God) to be a place of 50,000, or, according to the census of 1898, to 215,780 inhabitants. Its harbor, formerly dangerous, has, by the construction of a costly breakwater, been rendered one of the most serviceable in the kingdom.

HIPPARCHUS, the founder of mathematical astronomy, was born at Nicaea in Bithynia. The years of his birth and death are both unknown, but the period of his activity, according to the evidence of his observations, which have been preserved by Ptolemy, must have been between 160 and 125 B.C.

HIPPEL, THEODOR GOTTLIEB VON, a German author, known chiefly as a humorist, was born on January 31, 1741, at Gerdauen in East Prussia, where his father was rector of a school. In his sixteenth year he went to Königsberg to study theology and also studied law. He was successful in his profession, passing from one grade to another, until in 1780 he was appointed burgomaster and director of police in Königsberg, and in 1786 privy counselor of war and president of the town. To write books in his country house near Königsberg was his favorite amusement, and some of them have still a certain popularity. Perhaps the best known is his *Ueber die Ehe*

(Concerning Marriage). He has also works on *The Social Improvement of Woman*, and on *Female Education*. He died on April 23, 1796, leaving a considerable fortune.

HIPPO. See **BÔNE**.

HIPPOCAMPUS, or **SEA-HORSE**. The small fishes thus named constitute, together with the Pipe-fishes or *Syngnathi*, a distinct order of the class of fishes, that of Lophobranchs or fishes with the gills arranged in tufts. The name "Sea-horse" has been given from the singular horselike shape of the head and fore-part of the body. The head is compressed, and is prolonged into a flat snout, at the end of which opens the small mouth. The eye occupies the same position as in the horse, and the head is joined at an angle to a narrow and curved neck, which posteriorly is dilated into the broader body. As in all the fishes of this order, the body is not covered with soft skin or scales, but incased in a mail composed of hard and tough scutes, which are of a more or less quadrangular shape, and generally armed with tubercles or spines. The tail is long, flexible and prehensile, without caudal fin. These fishes are very bad swimmers, their locomotion being entirely dependent on the long dorsal fin which slowly propels them by a rapidly undulating screw-like motion; placed in the middle of the back of a body which generally occupies a vertical or oblique position in the water, this order of locomotion has a propelling power far inferior to that of a terminal caudal fin. By means of their prehensile tail the sea-horses attach themselves to the stems of seaweed or corals, which they resemble so closely in their outward appearance that it is difficult to distinguish them,—a resemblance which is still more increased in a group of sea-horse (*Phyllopteryx*) in which many of the spines and tubercles bear long tapering bands like the fronds of seaweeds.

HIPPOCRATES, termed the "Father of Medicine," was born, according to Soranus, in Cos, in the first year of the 80th Olympiad, i.e., in 460 B.C. He was a member of the family of the Asclepiade, and was believed to be either the nineteenth or seventeenth in direct descent from Æsculapius. It is also claimed for him that he was descended from Hercules through his mother, Phænarete. He studied medicine under Heraclides, his father, and Herodicus of Selymbria; in philosophy Gorgias of Leontini and Democritus of Abdera were his masters. His earlier studies were prosecuted in the famous Asclepion of Cos, and probably also at Cnidos. He traveled extensively, and taught and practiced his profession at Athens, probably also in Thrace, Thessaly, Delos, and his native island. He died at Larissa in Thessaly, his age being variously stated as eighty-five, ninety, one hundred and four and one hundred and nine. The incidents of his life are shrouded by uncertain traditions, which naturally sprang up in the absence of any authentic record; the earliest biography was by one of the Sorani, probably Soranus the younger of Ephesus, in the second century; Suidas, the lexicographer, wrote of him in the eleventh, and Tzetzes in the twelfth century. In all these biographies there is internal evidence of confusion; many of the incidents related are elsewhere told of other persons, and certain of them are quite irreconcilable with his character, so far as it can be judged of from his writings and from the opinions expressed of him by his contemporaries; we may safely reject, for instance, the legends that he set fire to the library of the temple of health at Cnidos, in order to destroy the evidence of plagiarism, and that he refused to visit Persia at the request of Artaxerxes Longimanus, during a pestilential epidemic, on the ground that he would in so doing be assisting an enemy. He is re-

ferred to by Plato as an eminent medical authority, and his opinion is also quoted by Aristotle. The veneration in which he was held by the Athenians serves to dissipate the calumnies which have been thrown on his character by Andreas, and the whole tone of his writings bespeaks a man of the highest integrity and purest morality.

HIPPOLYTUS, an ecclesiastical writer belonging to the first half of the third century. Of the details of his life little that is authentic is known. He appears to have been born in the latter half of the second century. From the fact that he employs Greek as his mother tongue, it has been supposed that he belonged to the eastern portion of the Roman empire; but this conclusion is by no means stringent, and there are various indications in his writings that he had passed some at least of his early years in Rome. As regards the close of his life our most trustworthy information is derived from the chronographer of 354 (Mommson *Ueber den Chronographen vom Jahre 354*, Leipzig, 1850), according to whom "the presbyter" Hippolytus in the time of Alexander Severus (235) was banished along with the Roman bishop Pontianus to Sardinia, where, it seems to be suggested, he died.

HIPPOLYTUS, ST., according to the Roman breviary, was one of St. Lawrence's converts, who, when summoned before the emperor Valerian on account of the practice of his religion, made a public profession of Christianity. First beaten with rods, he was finally delivered over along with all his family to death, the mode of execution in his case being similar to that by which Hippolytus the son of Theseus perished.

HIPPONAX, of Ephesus, a poet placed third, after Archilochus and Simonides, among the classic iambic poets of Greece. Expelled from Ephesus in 540 B.C. by the tyrants Athenagoras and Comas, he took refuge in Clazomenæ. There his deformed figure and malicious disposition exposed him to the caricature of the Chian sculptors Bupalus and Athenis; and he revenged himself by issuing against them a series of satires.

HIPPOTAMUS, a family (*Hippotamidae*) of artiodactyle ungulate mammals comprising two genera, each containing a single living species. Of these the best known is the hippopotamus, occurring only in Africa, where it abounds in many of the river courses. It is a huge, unwieldy creature, measuring in the largest specimens fully fourteen feet from the extremity of the upper lip to the tip of the tail, while it ordinarily attains a length of twelve feet, with a height of five feet at the shoulders, and a girth round the thickest part of the body almost equal to its length. Its remarkably small ears are exceedingly flexible, and are kept in constant motion when the animal is seeking to catch a distant sound. Its eyes are placed high up on the head, and but little below the level of the ears; its gape is wide, and its upper lip thick and bulging so as to cover over even the largest of its teeth when the mouth is closed. It is provided with a considerable number of molar teeth adapted for grinding vegetable substances, and a formidable array of long spear-like incisors and curved chisel-edged canines or tusks which, according to Baker, root up the rank grass like an agricultural implement. Its legs are short, so that the body is but little elevated above the ground; and its feet, which are small in proportion to the size of the animal, terminate in four short toes each bearing a small hoof. With the exception of a few tufts of hair on the lips, on the sides of the head and neck, and at the extremity of the short robust tail, the skin of the hippopotamus, some portions of which are two inches in thickness, is entirely destitute of covering. It is usually of a dark fleshy red color, irregularly marked with blackish spots. The

hippopotamus is a gregarious animal, living in herds of from twenty to forty individuals on the banks and in the beds of rivers, in the neighborhood of which it most readily finds its appropriate food. This consists chiefly of grass and of aquatic plants, of which it consumes enormous quantities, the stomach of one of those creatures being capable of containing from five to six bushels. They feed principally by night, remaining in the water during the day, although in districts where they are little disturbed by man they are less exclusively aquatic. In such remote quarters they put their heads boldly out of the water to blow, but when rendered suspicious by man's persecution, they become exceedingly cautious in this respect, only exposing their nostrils above the water, and even this they prefer doing amid the shelter of water plants. In spite of their enormous size and uncouth form, they are expert swimmers and divers, and can, it is said, remain easily under the water from five to eight minutes. They are also said to walk with considerable rapidity on the bottoms of rivers, beneath at least a foot of water. At nightfall they come on land to feed; and when, as often happens on the banks of the Nile, they reach cultivated ground, they do immense damage to growing crops, destroying by their ponderous tread even more than they devour. To scare away those unwelcome visitors the natives in such districts are in the habit of kindling great fires at night. Although they do not willingly go far from the water on which their very existence depends, occasionally they have been found to travel long distances by night in search of food, and in spite of their clumsy appearance they are able, according to Baker, to climb up steep banks and precipitous ravines with astonishing power and ease.

The hippopotamus does not confine itself to rivers only, but when opportunity occurs of exercising choice it has been known to prefer the waters of the ocean as its home during the day. Of a mild and inoffensive disposition, it seeks to avoid collision with man; when wounded, however, or in defense of its young, it is wont to exhibit the greatest ferocity, and the native canoes are frequently capsized and occasionally demolished by its infuriated attacks, its usual bellowing grunt then becoming loud enough to be heard a mile away. As among elephants, so also among hippopotami there are "rogues"—old bulls which, having been expelled from the herd, have become soured in solitude; these are at all times dangerous. Assuming the offensive on every occasion, they attack all and sundry without shadow of provocation; the natives, therefore, are careful to avoid the haunts of those *solitaires*, which are usually well known.

The rifle of the European has proved the most potent destroyer of the hippopotamus; but to prove effective it must be aimed at the head, the most vulnerable points in that region being immediately behind the ear and in the eye. Everywhere regarded as a valuable prize, the natives employ a variety of methods in order to secure it, the most common of these being the use of an iron harpoon attached to a line.

Another native method of destroying those animals is by means of a trap known as the "downfall," consisting of a heavy wooden beam armed at one end with a poisoned spearhead and suspended by the other to a forked pole or overhanging branch of a tree.

The female is less in size than the male, and is exceedingly shy, taking to the water with her young, which she usually carries astride on her neck, on the slightest alarm. It is only after long practice that the young become able to remain as long under the water as their parents, and for this reason the females while tending them come much oftener to the surface than their own necessities require. The period of gestation, as observed

in females confined in the Zoölogical Gardens of London and Paris, extends to nearly eight months; the young reach maturity in five years; and the full term of life in the species is believed to extend to thirty years. The male hippopotamus which died some years ago in the Zoölogical Gardens, London, was captured in August, 1849, when only a few days old; it had thus nearly attained the age of twenty-nine, while an examination of its dead body disclosed, says Professor Owen, "no special morbid appearance to suggest that death from old age had been anticipated." The flesh of the hippopotamus is generally considered a delicacy, both by natives and colonists, although, according to Livingstone, there are certain tribes on the Zambesi who have as great an abhorrence of hippopotamus meat as Mohammedans have of swine's flesh.

The skin of the hippopotamus is turned to profitable account in the manufacture of elastic whips, which are in great demand throughout the African continent. The skin, according to Schweinfurth, when fresh is cut into long quadrilateral stripes, which when half-dried are trimmed with a knife and afterward hammered out, like iron on an anvil, into round whips. As several hundreds can be made from a single hide, that part is of considerable commercial value. Still more valuable are the tusks and incisor teeth, which, from their extreme hardness and the fact that they do not readily become yellow, are now largely used in the manufacture of artificial teeth. The hippopotamus formerly abounded in such rivers as the Nile, the Niger, the Senegal, and most of the rivers of South Africa. It is now, however, becoming gradually more restricted in its distribution, having disappeared altogether from the Egyptian Nile,—although still abundant in its Abyssinian tributaries,—as well as from the rivers of Cape colony.

The Liberian hippopotamus (*Charopsis liberiensis*), the only other existing member of the family, is exceedingly rare, having been only known until recently from the two skulls on which the genus and species were founded. It differs from the common species in possessing only one pair of incisors in each jaw instead of two, and in several other minor points. A few years ago a young specimen of this rare species was brought alive to England from the Scarcies river, north of Sierra Leone, but it died soon after landing. The species is found on the west coast of Africa and on certain of the rivers flowing into Lake Chad.

Although there are thus only two living species, both of which are confined to Africa, the hippopotamus family was both larger and more widely distributed in former periods of the earth's history, fossil remains of at least nine species having been found in the Tertiary deposits of Europe and India. In Europe they occur as far north as Belgium and the south of England, but they are found nowhere in such abundance as in the island of Sicily, from which they were formerly exported in shiploads to England and France, where they were used in the manufacture of lampblack and manure. The occurrence of those animals in a place which they could not possibly have reached had it always been an island, is regarded as one of the many proofs that dry land existed during some portion at least of the Tertiary period between Italy and Africa.

HIRING, in law, may be defined as a contract by which one man grants the use of a thing to another in return for a certain price. It corresponds to the *locatio-conductio* of Roman law. That contract was either a letting of a thing (*locatio-conductio rei*) or of labor (*locatio operarum*). The distinguishing feature of the contract was the price. Thus the contracts of *mutuum commodatum, depositum* and *mandatum*, which are all gratuitous contracts, become, if a price is fixed, cases of

locatio-conductio. Hiring, in its modern acceptance, would generally be applied to contracts in which the services of a man or the use of a thing are engaged for a short time and does not apply to real estate, for which the equivalent term would be "renting."

HIRSCHAU, or **HIRSAU**, a village within the amt of Calw and the circle of Schwarzwald, Württemberg, on the Nagold, is a station on the Pforzheim-Horb Railway, and has paper and other manufactories.

HIRSCHBERG, the chief town of a circle in Prussian Silesia, government district of Liegnitz, is beautifully situated at the confluence of the Bober and Zacken, and on the Silesian mountain railway thirty miles southwest of Lauban by rail.

HIRTIUS, AULUS, one of Cæsar's chief supporters and most intimate friends. He was with him as *legatus* in Gaul. After the civil war broke out in 49 B.C., he seems to have been generally stationed in Rome to protect Cæsar's interests there. On March 27, 43, after Cæsar's death a double battle was fought at Mutina between Antony and the senatorial party. In the first Antony had the upper hand, and Pansa was mortally wounded; and in the second Hirtius completely defeated the enemy, but was himself killed in the subsequent assault on the enemy's camp.

HISPANIOLA. See **HAYTI**.

HISSAR, British district belonging to the division of the same name, in the lieutenant-governorship of the Punjab, India. Hissar forms the western border district of the great Bikaner desert, and consists for the most part of sandy plains dotted with shrub and brushwood, and broken by undulations toward the south, which rise into hills of rock like islands out of a sea of sand. Rice is the staple crop of the district. In favorable seasons, cotton is extensively grown in lands irrigated by the Western Jumna Canal.

HISSAR, municipal town and administrative headquarters of the above British district. Population about 20,000.

HISSAR, a state in Central Asia, dependent on the amir of Bokhara. It forms that part of the basin of the Oxus which lies on the north side of the river, opposite the Afghan province of Balkh.

HISTOLOGY. **ANIMAL HISTOLOGY** (from *ἱστός*, a web or tissue, and *λόγος*, discourse) is the study of the minute structure of the tissues of animals. By a tissue is meant any part of an organism which has undergone special changes in structure in adaptation to the performance of special functions. These special changes are expressed by the general term "differentiation." In the lowest animal organisms, the whole of whose bodies are composed of the undifferentiated living substance termed "protoplasm," we find all its functions shared by every part of the organism. An amoeba, for example, it is well known, is capable of finding, seizing, devouring, digesting, and assimilating food, has a special provision for collecting fluid and pumping it out of its body, respire by its whole surface, moves about apparently where it will, exhibits a sensibility to tactile impressions, and reacts in all probability to smell if not to sound and light—in short, is capable of performing, although with the lowest possible amount of activity, almost every function which animals vastly higher in the scale of organization exhibit. But even in the amoeba we cannot say certainly that there is no differentiation of its protoplasm. For a condensed portion—the nucleus—is set aside to initiate the reproductive function, and it is by means of the external and firmer layer (ectoplasm) that its movements are effected and its relations with the external world maintained, while the internal more fluid protoplasm (endoplasm) is concerned with the digestion of the

food. Still there are simple organisms whose protoplasm is probably absolutely undifferentiated. On the other hand, there are other organisms which are also regarded as composed of simple protoplasm, and are constituted by a single cell, which nevertheless show a marked progress in the differentiation of portions of their substance apart altogether from the presence of a nucleus. Such differentiation in unicellular organisms generally takes the form of the production of a shell or "test," as in the *Foraminifera* and in *Noctiluca*, which subserves purely passive functions of sustentation or defense. It is not certain in such cases whether the structure thus produced is formed by the direct conversion of the protoplasm or by an exudation on the surface which subsequently hardens. But portions of the protoplasm may be set aside for the performance of active functions. We see this in its production in the form of locomotory organs, either temporary (pseudopodia) or permanent (cilia). But in neither of these can any actual change in the minute structure of the protoplasm be observed. A differentiation does, however, occur in one remarkable instance—the flagellum, namely, of the *Noctiluca*, which exhibits as definite a transverse striation as does the cross-striated or voluntary muscular tissue of the higher animals, in which structural peculiarity it is impossible not to infer a relation to its contractile functions; and similarly, in the *Vorticellidae*, there is a differentiation of the protoplasm of the rapidly contractile stalk.

Whereas in the more highly organized unicellular animals portions of the single cell are thus set aside for the performance of special functions, and modified in structure accordingly, in multicellular animals, on the other hand, we find whole cells and sets of cells set apart and differentiated. It is to such modifications in sets of cells in multicellular organisms, rather than in portions of the protoplasm of a unicellular organism, that "histological differentiation" is commonly restricted; and each such set of cells, destined for the performance of a special function, and modified accordingly in structure, is denominated a "tissue."

The animal tissues may be classed under the four heads of *Epithelium*, *Connective Tissue*, *Muscular Tissue*, and *Nervous Tissue*. Of these four classes of tissue the epithelium is the most primitive and least altered. In the development of the *Metazoa* the numerous embryonic cells which result from the division of the single cell—the ovum—tend in nearly every case to arrange themselves as a single layer surrounding a central cavity (unilaminar condition of the blastoderm). Presently a part of the wall of the hollow sphere becomes invaginated, so that, instead of a vesicle inclosed by but a single layer of cells, a cup (*Gastrula*, Haeckel), is produced, the wall of which is formed by two layers derived from the original single layer, and separated from one another by a narrow interval (which is all that remains of the original cavity of the vesicle) except at the orifice of the cup, where they are continuous (bilaminar condition of the blastoderm). At this part some cells become separated from one or both of these two primary layers, and, extending in and occupying the cleft-like space which separates them, become a third layer of cells, which differs from those of the other two in not being arranged into a continuous membrane, and not, therefore, forming an epithelium (trilaminar condition of the blastoderm). Now, of these three layers, the outer one, or ectoderm, and the inner one, or endoderm, give rise to all the epithelial tissues of the body. The nervous tissues are also derived from the ectoderm; whereas the connective and muscular tissues originate in the mesoderm or middle layer. In

most of the *Celenterata*, however, the mesoderm is not developed at one part only of the embryo as in the higher *Metazoa*. In the hydroid polyps and *Medusa* it never becomes completely distinct from the ectoderm and endoderm, although a jelly-like sustentacular substance may be formed to a greater or less extent between the two primary layers, and cells may pass into it from one of them, so that a kind of mesoderm is thus produced. In the *Medusa*, also, the muscular function is performed by cells which either still have their place in the general layer of the ectoderm or are but imperfectly separated from it; and here, again, the commencing separation does not occur at one part only, but over extensive tracts of the surface. Nevertheless these cells are modified in structure precisely in the same way as those which in higher animals are derived from the mesoderm. The nervous functions are also performed by cells and fibers, which, although they show those modifications of structure which in the higher animals are characteristic of nervous tissue, yet remain strictly confined to the ectoderm, and do not, as in the higher animals, penetrate into the mesoderm.

The Epithelial Tissues.—Although the layers of cells which are first formed are layers of epithelium, and, therefore, the epithelial tissues are the first to be produced, nevertheless we find that they undergo less modification in structure than any of the other three classes of tissue. As before said, they invariably consist merely of cells cemented together by an imperceptible amount of intercellular substance, and the cells themselves only show minor degrees of modification in shape and structure, at least as compared with the other tissues constituted mainly of cells, namely, the muscular and nervous.

The Connective Tissues.—The connective tissues are characterized by the great development of intercellular substance in comparison with the cells; indeed in those animals in which connective tissue may first of all be said to appear, there is an entire absence of cellular elements properly belonging to the tissue. This is the case in many of the *Celenterata*, in which the connective tissue is represented merely by a layer, more or less thick, of hyaline substance, which undoubtedly performs a sustentacular function, in addition to connecting together the epithelial layers of the ectoderm and endoderm.

The intercellular or ground substance almost invariably takes a prominent part in the formation of connective tissue. It is of a semi-fluid nature, and often contains in addition to albumen a certain amount of mucin. In most cases the cells of the connective tissue separate themselves from the primary layers before the formation of this ground substance; indeed the mesoderm is at first chiefly formed of these cells.

The connective tissues of invertebrates are similar to those of the vertebrate; at the same time it must be admitted that there are not unimportant differences in chemical constitution, such as the absence of a substance yielding gelatin, and the absence for the most part of mucin, both of which are characteristic constituents of vertebrate connective tissue. On the other hand the anatomical characters of the elements, both cells and fibers, are in most cases sufficiently well marked to be recognizable.

The Muscular Tissues of Animals.—In the Vertebrata three kinds of muscular tissue are met with—the plain or involuntary, the cross-striated or voluntary, and the cardiac or heart muscle. Undoubtedly the last-named is to be regarded as a transitional form between the other two, for it combines some of the characters of each. This is especially well seen in the lower vertebrates, in which the muscular fibers of the

heart consist of long, tapering, uninuclear cells, in form resembling the plain contractile fiber-cells, but differing from these and resembling the multinucleated voluntary muscular fibers in exhibiting distinct transverse striations. Although these three kinds of muscular tissue thus differ from one another in this respect, they agree in one important character. Whether transversely striated or not, they all exhibit a distinct longitudinal striation of their substance, which is probably indicative of a popularity which the protoplasm of the cell has assumed at the same time with the faculty of becoming rapidly shortened in the direction of its length and coincidentally with the loss of the power of contracting in other directions. Moreover, this longitudinal striation is generally associated with the property of double refraction, which is exhibited to a marked degree by all kinds of muscular tissue.

The muscular fibers of the Invertebrata very closely resemble those of vertebrates. In most cases the differentiation of the muscular substance is not so complete as in the voluntary muscles of vertebrates and especially of mammals, but there is a striking exception in the *Arthropoda*, and especially in insects, where in conformity with the greater muscular activity they possess we find far better marked structural features. On this account the muscles of insects have been especially carefully studied with a view to the elucidation of the structure of muscle generally.

The Nervous Tissues of Animals.—The nervous tissue of vertebrates is composed firstly of cells—the nerve-cells or ganglion-cells—and secondly of nerve-fibers. Most of the nerve-fibers possess a sheath formed of nucleated cells wrapped around the fiber, and in this sheath a peculiar white fatty so-called medullary substance is accumulated in some fibers, so that they are distinguished from the others as the white or medullated fibers. There is reason to believe that every nerve-fiber is connected with at least one nerve-cell, and conversely, that every nerve-cell is connected directly or indirectly with one or more nerve-fibers. Nerve-cells are generally comparatively large solid-looking corpuscles, with a relatively large nucleus and nucleolus, and every developed nerve-cell has either one or two or a greater number of processes, which may or may not be ramified. It is certain that from many nerve-cells one process of the cell passes into and becomes a nerve-fiber. Nerve-cells are always traversed by exquisitely fine fibrils—nerve-fibrils—and these pass out from the cell into its processes. Apart from any sheath which it may possess, a nerve-fiber is composed of one or more nerve-fibrils, which are embedded in a soft interfibrillar substance. The nervous tissue of vertebrates is developed from that part of the ectoderm which occupies the middle of the dorsal surface of the embryo. In the bird and mammal the epithelial cells in this situation become cut off from the general ectoderm by the formation of a groove which subsequently closes over and forms a canal—the neural canal. The innermost ectoderm cells which form the wall of this canal acquire cilia at the end which is turned toward the cavity, while the other end of each cell is prolonged into branching processes which collectively form a network among the deeper lying cells of the wall. The latter multiply considerably, and moreover groups of them grow out from the sides of the neural canal as the roots of the nerves. The nerve-fibers themselves seem to be formed either by the outgrowth of undivided processes from these cells of the neural canal, or by the junction of one elongated cell with others. At any rate the fibers are to be looked upon as outgrowths or prolongations of nerve-cells. But some of the outgrowths of the nerve-cells, instead of passing into nerve-fibers, become ramified, and

eventually break up into fine twigs, each of which is occupied by a nerve-fibril, and these form by their interlacement a network which joins that of the branched processes of the ciliated epithelium.

With the exception of the formation of the medullary substance in the sheath, the nervous tissue of the invertebrate *Metazoa* agrees precisely, so far as the minute structure is concerned, with that of vertebrates. The lowest forms in which nervous structures have been found are the *Medusæ*.

VEGETABLE HISTOLOGY.—By Vegetable Histology is meant the study by means of the microscope of the texture, web, or tissue of which plants are composed. It may be considered as synonymous with the minute anatomy of plants.

Nature of the Vegetable Cell.—If a small portion of the contents of the fertilized embryo-sac of the *Phaseolus multiflorus* (scarlet-runner, or French bean) be examined in a drop of water on a slide, it is seen to consist of protoplasm with a number of small free cells, in different stages of development, floating in it. These cells consist of little rounded masses of protoplasm with a single contour line; they have the protoplasm more or less granular; and each contains a rounded solid body, the nucleus, usually with a small spot, the nucleolus. Other cells in the preparation have a distinct wall with a double contour line, these being older and more fully developed. In examining the cells it is usually best not to employ pure water, but to use instead a solution of sugar or gum (1 part to 50 or 100 of water). Strasburger recommends, for examining the contents of the embryo-sac in phanerogams, a 3 per cent. solution of sugar, to which is added on the slide one drop of a 1 per cent. solution of osmic acid. Absolute alcohol may also be used for fixing the protoplasm in a nearly unaltered state. A longitudinal section of the growing end of the root of *Fritillaria imperialis* will exhibit the different stages of development of tissue cells. Near the apex the cells are more or less hexagonal in shape, and have a marked wall with a more or less distinct double contour. Inside the cell-wall, and in close contact with it, is the protoplasm, a densely granular, soft, inelastic mass, consisting of a mixture of albuminoids, and having in the center a round and relatively very large solid nucleus, with one or two nucleoli. In both *Phaseolus* and *Fritillaria*, as the cell enlarges, clear spaces, called vacuoles, but filled with cell-sap, that is, water with substance in solution, appear in the protoplasm of the cell. In some algae contractile vacuoles are met with. The ordinary vacuoles rapidly increase in number and enlarge, separating the protoplasm into two parts—one in close contact with the wall of the cell, the other forming strings of varying size and thickness separating the vacuoles. Presently the vacuoles all coalesce and form a central cell-sap cavity, the protoplasm forming a completely closed sac inside the cell-wall. The nucleus remains embedded in the protoplasm, and is pushed to one side, appearing as if in contact with the wall. The vacuolated condition of the protoplasm may be considered as representing the cell at its state of greatest activity; the central cell-sap cavity is usually seen in tissue-cells, as in *Fritillaria*, and may be taken to indicate a condition of diminished activity. Further changes take place in tissue cells. The protoplasm with its nucleus may disappear and the cell-sap remain, or even the cell-sap itself may disappear sooner or later, and the dry cell-walls, as those of cork, be left. The conditions here described in *Fritillaria* may be taken as typical of all young tissue cells.

The protoplasm is the essential part of the cell, and by it all the other parts are formed, as well as all the substances, such as chlorophyll and starch, that are con-

tained in cells. When the cell contains protoplasm it can grow, multiply, and elaborate new chemical compounds; when the protoplasm disappears it ceases to perform any of these functions, and passively acts as a protection to deeper cells, or permits certain physical processes to take place, as the transport of water through the walls. The substance of the protoplasm seems to consist of a mixture of various albuminoids, and probably of other nitrogenous compounds. It is a more or less granular, soft, inelastic substance, never a true fluid, but varying in consistence in accordance with the quantity of water it contains.

Protoplasm is usually separable into two parts, an inner portion, endoplasm, more or less granular, and an outer more dense layer, the ectoplasm or primordial utricle, which is quite free from granules. A similar layer surrounds the protoplasm of the nucleus.

The living protoplasm exhibits movements either when inside a cell-wall or when the protoplasm is free and in the condition of a wall-less or primordial cell. The constant changes in protoplasm must be always accompanied by movement, but these are usually too small to be visible, and it is only in a few cases that the amplitude of the movements renders them visible. The movements are of four kinds, and are distinguished as rotation, circulation, amoeboid, and ciliary.

The cell-wall is a thin, elastic, transparent and colorless membrane, destitute of visible openings (except in some cells of *Sphagnum* and in bordered pits), but easily permeated by water and gas. The walls of young cells consist almost exclusively of pure cellulose sulphuric acid and by ammoniacal solution of cupric oxide.

Mineral matters are often deposited in cell-walls. Calcium carbonate occurs rarely, calcium oxalate frequently, and silica is the commonest of all. Calcium carbonate forms the cystoliths of *Ficus* and of the *Acanthaceae*, crystals or masses of crystals imbedded in the cell-wall but projecting into the cavity although surrounded by the substance of the wall. In corallines and many algae, as also in the *Charaeae*, carbonate of lime is abundant in the cell-walls. Calcium oxalate crystals occur in the cell-walls of many plants, in other cases forming small granules. The crystals of calcium carbonate are soluble in acetic acid, while those of oxalate are not, although soluble in dilute nitric and hydrochloric acids. Silica is abundant in the *Diatomaceae* and also in the cells of many of the higher plants, (*Equisetum*, grasses, beech, etc.)

Products of desorganization or degradation of the cell-wall occur in the form of gum, gum-resins, or resins, examples of which may be seen in the cherry, gum-arabic, gum-tragacanth, myrrh, etc. Gum-arabic consists of arabin, gum-tragacanth of bassorin, and cherry-gum is a mixture of the two. These substances, when formed, are apparently of no further use to the plant, and are produced by the destruction or desorganization of the cell-walls, as portions of the cell-wall can be distinctly traced when gum-tragacanth is examined microscopically.

Certain substances are formed by the protoplasm and separate from it in the form of granules or crystal-like bodies. The most important of these substances are chlorophyll and starch, the less important are aleurone grains and crystalloids.

The cell-sap consists of water with different substances in solution, the substances varying in different cells, and also changing in the same cell from time to time during growth. It saturates the whole wall and protoplasm, and collects in the vacuoles and cell-sap cavity.

Cytogenesis.—The enlargement of organs of plants is not only accompanied by an increase in the size of the individual cells, but new cells are also formed in the

part, these new cells, which are at first small, soon enlarging to their full dimensions. Usually the formation of a new cell takes place by the division of the protoplasm of a preexisting cell, the mother-cell, into two portions of equal or unequal size, the daughter-cells. These daughter-cells in turn enlarge, and may each become the mother-cells of new daughter-cells. In this way by cell-division the vegetative cells of plants are increased in number. The process of reproduction in plants is invariably associated with the formation of a new cell or cells, and in general the process is very different from that of division, there being often a diminution in the number of cells, instead of an increase.

Union of Cells to Form Tissues.—Cells are usually united together to form an aggregate governed by some common law of growth. Such an aggregate of cells is called a tissue. Tissues are formed in different ways, and in accordance with their mode of formation are distinguished as true and false. A true tissue is formed by cell division. In this way the tissues of the higher plant are formed either originally from a single cell (apical cell) at the apex of the part, or from several cells (initial cells) situated at the growing point. In some of the lower plants false tissues are formed, rarely in some of the higher ones. The first mode of formation of a false tissue is noticed in some of the algae, as in *Pediastrum* and in *Hydrodictyon*, as well as in the formation of the endosperm in the embryo sac of many plants, as in *Phaseolus*, *Gnetum*, etc. Here the cells are at first separate and distinct, but these loose cells become aggregated together, often, as in *Pediastrum* and *Hydrodictyon*, to form a beautiful and regular figure. In such instances the wall separating two cavities is a double structure formed by the union of two distinct walls. In the endosperm of the higher plants, when the false tissue is formed, the cells divide in the ordinary way, and at length give rise to a true tissue, as different modes of cytogenesis may occur in the same plant, either in different parts or at different times. The second mode of formation of a false tissue is seen in the fungi and lichens, in the peculiar hyphæ tissue so characteristic of these plants. The cells form long narrow rows or filaments, which branch and interlace, producing a network of interlacing fibers, but without the walls becoming fused firmly together as in *Pediastrum*. In some cases the hyphæ cells swell up and come into such close contact by mutual pressure that they form a tissue so like ordinary cell-tissue that it has been denominated pseudo-parenchyma. This variety of tissue occurs commonly in the higher fungi, as in the mushroom,

Walls of Tissue-Cells.—The cell-wall separating the contiguous cavities of two young cells appears as a simple homogeneous plate or lamella of pure cellulose. As the tissue grows older and the wall thickens, it apparently separates into distinct layers having different chemical and physical properties, so that in some cases it appears as if each cavity had its own special wall separated from the neighboring wall by a thin or thick layer of material, to which the older botanists gave the name of intercellular substance. The thickening layers usually exhibit a well-marked stratification, the strata often differing in chemical composition, as in pine-wood, in the bast of laburnum, or in the epidermis of *Viscum*, *Ephedra*, *Nerium Oleander*, etc.

HISTORY, in the most correct use of the word, means the prose narrative of past events, as probably true as the fallibility of human testimony will allow.

In practice, the line between history and mythus is often not easy to draw; but the theoretical distinction is plain. History reposes, however remotely, on contemporary witness to the fact related. Written records

are not absolutely indispensable, as tradition *may* supply their place and represent authentic contemporary testimony. But tradition is very insecure and apt to be equally inventive and oblivious. It is in the half light of tradition that mythus is born of the creative fancy of man, and the difficulty of separating fact from fiction in this border-land of mingled fable and reality very often amounts to impossibility.

The field of history is in consequence very limited, both in time and space, in proportion to the length of human existence and the area of the earth's surface occupied by man. Primitive and savage man has no history, because the struggle for existence consumes all his energies, and he has neither time nor faculty to think of himself as a social being, much less to make record of social events. But even when partially civilized, mankind is often incapable, not only of writing history, but of furnishing the materials of it. Under a system of caste, or conservative theocracy, or oppressive tradition as in India, Egypt, and China respectively, the social evolution is so slow that it hardly seems to move at all. The grandson lives among conditions hardly differing from those of the grandfather. In such a state of things the very subject-matter of history is wanting. Nothing attracts less notice than immobility, and large populations have often lived under conditions which for whole generations did not seem to vary. The vast and vacant annals of the East show that the arts of peace and war may attain considerable development without history or its materials being produced in consequence.

If these views be correct we can only allow a period of about 4,000 years as the limit of genuine history in point of time. The beginning would be with the historical books of the Old Testament. Before the Jewish records fail us the Greek have begun. The Romans follow in immediate succession, and the historical thread has never been broken since, though thicker and stronger in some epochs than in others. As regards area, history long dwelt exclusively on the shores of that inland sea which, if not the birthplace of the human race, have at least been the chief training-ground of its early youth and vigorous manhood. Civilization subsequently spread from the Mediterranean to remote islands and continents unknown to the ancients, and history has followed it. No doubt in time both will be coextensive with the globe; but that time has not yet come. It is still useful to remember that the materials of history now rapidly accumulating in the far West, the far South, and even the far East, owe their origin to that antiquity of which we are the heirs, to the civilization which took its rise in those ever-memorable centers named Rome, Athens, and Jerusalem.

Early history is never critical and painstaking in the investigation of facts. Neither the historian nor his readers or hearers have reached a stage of culture in which accuracy is highly valued. Early history is essentially artistic, its object is much more to charm the fancy and warm the emotions than to instruct the understanding. A good story, pathetic or humorous, is appreciated for its own sake independently of its truth. Striking pictures, dramatic situations, often told in dialogue, scenes in which virtue and vice are depicted on a colossal scale—these are the chief objects of the early historical writer, who mingles fact and fiction with the same naïveté as his brethren, the writers of the early epos and drama.

History is of two kinds,—the old or artistic type of history, and the new or sociological type. The artistic type, invented by the Greeks, remained the ideal of history till comparatively recent times. Its aim was perfection of literary form, weight and dignity of language, depth of moral and sagacity of political

reflection. The new history is to a great extent characterized by opposite qualities. Its preoccupation about literary form is secondary, moral reflection it rather avoids, but it is laborious beyond precedent in research, and above all it is pregnant with the notion that society is a great aggregate of forces moving according to laws special to it, and similar to those producing evolution and growth analogous to what we see in other forms of life. The remainder of this article could not perhaps be better employed than by a short examination of these two types of history, including some reference to the causes which brought about a transition from one to the other.

A history of history is a desideratum in literature. The merit of such a work, if properly done, would consist, not only in the criticism of particular authors, but in a comparison of their epochs and social surroundings, and a pointing out how these influenced the character and quality of their historical writing. It is, for instance, worthy of notice that history is far more sensitive and dependent on public freedom than either poetry, science, philosophy, or jurisprudence. All these have flourished under governments more or less despotic, but history never. Tacitus seems to have felt this in the depth of his heart when he said that he was able to write as he did because of the "*rara temporum felicitas ubi sentire quæ velis et quæ sentias dicere licet.*" (That "rare happy time when you think as you will, and when thought gives license to speak.") Again, certain epochs are favorable to great historians, as periods of war are favorable to great soldiers. Rating the genius of the Greek historians as high as we please, and it is difficult to rate it too high, it is still manifest that they enjoyed exceptional advantages.

Continuing this vein of reflection, we might remark that it is a noteworthy fact that in history alone the Romans came nearest to their Greek models. Copyists in everything else, and inferior copyists, in history they equaled if they did not excel their masters. The Middle Ages would offer the historian of history ample scope for connecting the quality of historical writing with the social surroundings of the authors. The great monastic houses, such as Malmesbury, St. Albans, Eu, and many more, would be shown to have been such schools of history as they were, for very efficient reasons. The appearance of the modern Herodotus, Froissart, would seem meant expressly to show the union of opportunity and genius needed to produce great historical work. The dramatic struggle between feudalism and monarchy in the fifteenth century found a competent if somewhat rustic Tacitus in Comines, more friendly but on the whole not less severe to his bourgeois Tiberius, Louis XI. In the stirring times of the sixteenth century historians abound—Italians, Frenchmen, Dutchmen—too numerous to mention and too distinguished to be passed over with perfunctory notice here. And then occurs a really surprising phenomenon. History disappears from the continent of Europe for a century and a half. Between the Thirty Years' War and the Seven Years' War the Continent produced no historians whom the world cares to remember. History was indeed being written in France, the most witty, profound, and graphic since the days of Tacitus; but it was history which the author kept for himself and a remote posterity; not for a hundred years was the world to be permitted to gaze with wonder and admiration on the incomparable memoirs of St. Simon. But rebellious and revolutionary England gives us Clarendon and Burnet.

The old type of history, one might say, was a species of portrait painting which had often every merit except that of close likeness to the original. But it cannot be

denied that the old writers generally thought more of the brilliancy of their colors and the effectiveness of their pictures than of their exact truth. The old masters of history resembled, it is to be feared (if so honorable a comparison can be considered derogatory), the old masters of painting. Both thought little of what we call "local color," of close conformity to the scene or object delineated, provided they produced striking compositions with grand outline and rich tints which were attractive and beautiful for their own sake. When to this conception of their art we add their general apathy in research, the measure of their sins appears to be filled up in the eyes of a generation like ours, which has brought historical evidence under conditions nearly as stringent as those which regulate the depositions of a court of justice. Still it may occur to some persons that there is another side to this matter, and that the great men of old are not wholly without defense. They were indolent in research no doubt, or rather they did not attach the value that we do to it (if they had, they were not men to have spared their pains), but they were large, sympathetic, and humane. They wrote for a public composed of men of the world and not of specialists. Their manner is somewhat off-hand, but they are neither prigs nor pedants. It may be said generally, exceptions of course excepted, that the old historians were strong where their successors are weak, and the converse. Aiming chiefly at portraiture, they succeeded in it, as was only natural. Amid a crowd of errors on smaller matters, they often catch the true expression of a physiognomy, and hit off the salient points of a character with an insight and success which subsequent inquiry is often unable to modify.

The inferior quality of history in the seventeenth century and the first half of the eighteenth is the more remarkable from the contrast presented by the brilliancy of contemporary literature in other departments. Written by inferior men from a low point of view, or no point of view at all, history at last sank to such a degree in the public esteem as to be spoken of in a tone of contempt. Doctor Johnson openly despised it, and D'Alembert did nearly the same. And yet the time produced great antiquaries—Madox and Rymer in England, D'Achery and Mabillon in France, Maratori in Italy, Leibnitz in Germany. But history had no stamina or muscle.

When eighteenth-century writers are arraigned for their defective appreciation of the Middle Ages (the great stumbling-block) and remote periods generally, their critics forget the historical positions of the men they criticise. To write history in the eighteenth century was something very different from what it had been before, and this in several ways. First of all, the mere lengthening of the historic retrospect had enormously increased the field of historical survey. A writer of the eighteenth century looked back on nearly as much as we do; he had behind him the recent modern period, the long Middle Age, the barbarian epoch, those of Greece and Rome. And it was honorable to the men of the eighteenth century that they did not shrink from the task of writing on this immense expanse of history, imperfectly as they were prepared for it. Contemporaneous history may bring out some of the highest qualities of an historian—perspicacity, weightiness of judgment and language, skill in narrative, and so forth. But one quality it does not need and cannot display, insight into a remote age differing in culture, politics, and religion from those amid which the historian lives. Yet it was precisely the history of remote ages which the writers of the eighteenth century boldly undertook to treat. That they often failed is not surprising. It would have been a miracle if they had succeeded.

The unworthy interpretation of all political and religious phenomena with which the writers were unfamiliar, by sagacious references to state and priestcraft, is also apt at times to appear to us willfully perverse, and even disingenuous. We may be sure it was nothing of the kind, and only resulted from the inadequate degree of culture then attained.

But the historians in question were hindered not only by prejudice, which they could not avoid, from understanding the past; they were also hindered by a want of knowledge which it was impossible for them to have. When we see a man gravely ascribing the decline of old Rome to the fact that all the gold and silver after the division of the empire were carried to Constantinople, we realize the value of true conceptions relative to the wealth of nations. But in Montesquien's time the precious metals were regarded as the sole or chief sources of wealth, and he applied without hesitation to history a principle which he saw statesmen apply without hesitation to politics.

But a change was near—a change in feeling and a change in knowledge. That singular modulation of key in the moral life of Europe, often called, for want of a better term, the Romantic movement, which arrested and surprised the attention of the latter half of the eighteenth century, was felt in relation to history as well as to philosophy, politics, and religion. The tastes and the tempers of men changed with a strange rapidity. The eighteenth-century philosophy, as it is called, lately so high and apparently secure, was cast out with contumely. The recent idols—Locke, Hume, Voltaire, Diderot—were smitten down, and others needless to name were put in their place. The whole movement is now seen to have been retrograde, and finally abortive, though temporarily successful. But it had its *raison d'être* and even its uses, as all social phenomena have. Among its uses was the service it rendered to history. Where men had only recently seen barbarism, superstition, and ignorance, they and their sons saw an enchanted land of beauty, piety, and grace. Then came Sir Walter Scott, who turned a current already flowing fast into a headlong torrent. The Middle Age was studied eagerly, sympathetically, perhaps a little too much so; zeal never is according to knowledge. But the bringing of the Middle Age into the circle of serious historic study had an influence beyond its immediate object. When men had brought themselves to study and understand eleventh-century popes and emperors, monasticism, feudalism, scholasticism, they became bold and capable of further adventures in historical enterprise. After the heroic ages of Christendom, the heroic ages of Greece were opened to explorers. And soon all exclusiveness disappeared. The whole past history of man was felt to be worthy of man's study—a wide field into which many laborers entered. So much for the change in feeling.

No less a change had taken place in the condition of knowledge. Speculation had for a long time been feeling its way to a closer contact with the problems suggested by the growing wealth and industry of the modern world. Adam Smith in his memorable work resumed, coördinated, and enlarged the labors of his numerous predecessors, and placed the study of economics on a new and positive basis. That book was in truth a lofty historical review of the facts of the past, guided by the principles of economic science.

Both the moral and the intellectual tendencies at work to produce a new temper with regard to history received an incalculable impetus from the French Revolution. That cataclysm revealed the deeper forces of society which had lain silent and unsuspected under the deceitful calm of the *ancien régime* in its latter days. It was

very certainly a revelation, though light came from the flames of Tophet, in Mr. Carlyle's phrase. Men saw the depth of the abyss over which they had lived in quiet ignorance, and their notions on man, society, and history underwent a great change. Passions undreamed of were let loose, and the passions of the present threw light on those of the past. History was read with new eyes. With the peace of 1815 historical studies acquired an activity and scope they never had before. All history, it was perceived, needed rewriting from new points of view, with more knowledge, deeper insight, keener sympathy. The French led the van of the new movement with their usual brilliancy and mastery of literary form. But it was their position as the nearest witness and the greatest sufferers and gainers by the Revolution which did most to open their eyes. A truly illustrious band of scholars and writers under the Restoration, the Monarchy of July, raised history into a position of honor it had never enjoyed before. The Germans, with their solid erudition, were not slow in following the French. Between the two, the Middle Ages, Greek and Roman antiquity, and the history of the Christian Church were studied with a minuteness and breadth never known before. History had entered on its modern phase.

Ancient history, chiefly in consequence of the extraordinary zeal and diligence of the Germans in what they call the science of antiquity (*Alterthumswissenschaft*), has become a reality, vivid in interest, and fruitful in knowledge, instead of the nebulous unreality it had been before. The rejection of the fabulous elements in the histories of Greece and Rome was the first step, but a long one, which it required many years and much effort to make. The next was to obtain a firm grasp of the idea that the Greeks and Romans were living men, and not statues like the Elgin Marbles, and to look at their politics, institutions and religions with the discriminating eye of common sense, and a real wish to see them as they were. The true nature of Athenian democracy, of the Spartan oligarchy, of the commons and patrieans of Rome, of the party struggles which caused and justified the transition from the republic to the empire, has been put in a clear light, which can hardly be appreciated by those who are not aware of the darkness which it replaced. Points of view and lines of inquiry concerning the religion, government, institutions, taxation, and law of the ancient states have been opened up, of which the possibility in the old days was not suspected. The sociological knowledge of the present has illumined the past.

The history of the Middle Ages shows even greater results, and greater innovation. The great difficulty was the papacy. Between the Catholics, who regarded it as of divine institution, and the Protestants, who regarded it as a manifestation of Antichrist, and the sceptics, who despised both, and regarded it as mere superstition, this great center around which the life of the Middle Ages revolved had been unknown or misknown to a degree of absurdity. Gradually, as the nineteenth century arose wiser and sadder out of the chaos of the French Revolution, the immense part played by the church was at first dimly suspected, and at last with increasing clearness perceived. This must on every account be regarded as the greatest achievement of the modern school; it implied the unlearning of so many old errors, the acquiring of so many new truths, above all, the repression of so many deeply-rooted prejudices. It restored the continuity of history, in which the Middle Ages had hitherto appeared as an unexplained gap—an unwelcome wedge of barbarism thrust between the ancient and modern civilizations.

After the Middle Ages, the period which has been most illumined by the new lamp of history is that of the

early church, and the whole subject of religious dogma and institutions. In spite of the fierce controversies which have raged over this region, a large residuum of undisputed fact has been rescued from ignorance and prejudice, and church history is no longer a legend, but one of the most interesting chapters in the annals of the human mind.

As regards modern history, we are oppressed and nearly overwhelmed with the mass of new materials, and new discoveries which have been launched upon us. The diligent publication of state papers and documents, which all civilized states have taken in hand, has exceeded in the last half century all that had been done before in that direction. The result is that there are few periods of modern history which are not far better known to us than they were to the contemporaries who lived in them. But history in this field cannot boast of such laurels as she has won in the field of antiquity and the Middle Ages. There has been no great reversal of old points of view, no great triumph of historical perspicacity piercing through traditional error down to latent truth. Modern history has won its victories more by weight of metal than by the skill of its commanders, not that the generals have lacked skill, but they have had less occasion to display it.

The history of institutions has received much attention in recent times, and promises to be one of the most fruitful veins of inquiry yet opened, and this in reference both to primitive institutions, which are rather prehistorical, than historical, and the constitutions of states which have reached adult political life. The old Aryan tenure of land and village communities, and ancient law, whether in old Rome or modern Bengal, have been the subjects of elaborate investigation, embodied in works which mark a new departure in knowledge. The institutional history of political states is at the present moment perhaps the subject which attracts the most lively attention of scholars. It is not confined to the constitutional history of England, though England, as the mother of parliaments, has a fair claim to priority of interest. But the subject is narrowed and degraded by contemplating it from the point of view of modern politics, and chiefly in reference to the popular freedom or national wellbeing produced. The earnest historical inquirer is as impartial as the pathologist who studies disease equally with health. The institutions of despotism have their *raison d'être* and normal evolution as well as those of free governments, and the scientific historian will neglect the one as little as the other. In any case the history of the institutions of Europe from the times of the Frankish empire to the end of the French monarchy offers the widest field for courageous historical research. It has absorbed and transcended all those inquiries which used to be included under the somewhat jejune title of the history of civilization. Institutions in the secular order, and religions in the spiritual order, are now seen to be the most massive and permanent factors in human life, capable indeed of evolution and change, but little susceptible to the immediate action of man's intelligence and will, and yielding only to the new modifications brought about by time and the gradual transformation of ideas and moral conceptions, the result of increased knowledge.

It is hardly necessary to add that a broad distinction must be made between history and what has been called the philosophy of history, a term now replaced by the far better one "*sociology*," invented by A. Comte. Sociology has the purely scientific aim of investigating the nature and constitutions of societies, to discover the laws which regulate their growth and decay, to do in short for them what biology has already done for the animal and vegetable kingdoms. History, while it can

never again dispense with the assistance of sociology, remains occupied with the description of the social organism (at a given period) in its *ensemble*, and the term "descriptive sociology" has been suggested as an improvement on the old one, history. We may question whether the innovation will be accepted or is needed. The human interest attached to the story of man's past fortunes will always provoke the means of its own satisfaction, and there is little doubt that history, the name and the thing, as the highest form of prose literature, will continue to instruct and console mankind to the remotest generations.

HIT, the ancient *Is*, a town of Asiatic Turkey, village of Baghdad, is situated on the west bank of the Euphrates, seventy miles west-northwest of Baghdad.

HITCHCOCK, EDWARD, an American geologist, was born of poor parents at Deerfield, Mass., May 24, 1793. In geology his most important achievement was the examination and exposition of the fossil footprints of the Connecticut valley. The collection which he accumulated in connection with his investigations is contained in the Hitchcock Technological Museum of Amherst College, and a description of it was published in 1858 in his report to the Massachusetts legislature on the ichnology of New England. As a writer on geological science, Hitchcock was mainly concerned in determining the connection between it and religion, and employing its results to explain and support what he regarded as the truths of revelation. He died at Amherst, February 27, 1864.

HITCHIN, a market-town of Hertfordshire, England, is situated on the small river Hiz thirty-four miles from London, on the Great Northern Railway.

HITTITES, a warlike and powerful nation, whose center lay in the far north of Syria, between the Orontes and the Euphrates, but whose outposts about 1200 B.C. extended as far to the west as the Ægean sea. In the Egyptian inscriptions they are called the Khita or Kheta; in the Assyrian, the Khatti; in the Hebrew Scriptures, the Khittim. Some confusion has been caused in the treatment of the history of the Hittites by the uncritical use of the Old Testament.

HITTOREFF, JACQUES IGNACE, French architect, was born at Cologne, August 20, 1793. Succeeding Bélanger as Government architect in 1818, he designed many important public and private buildings in Paris and also in the south of France. One of his important discoveries was that color had been made use of in ancient Greek architecture. He died at Paris, March 25, 1867.

HITZIG, FERDINAND, exegete and Biblical critic, was born at Haaingen, Baden, where his father was an evangelical pastor, on June 23, 1807; received his early education at the *pädagogium* of Lörrach and at the lyceum of Karlsruhe, and entered the university of Heidelberg as a student of theology in the autumn of 1824. As a Hebrew philologist he holds very high rank, and as a constructive critic he is remarkable for the acuteness and sagacity shown in his combinations. His theories, however, are often carried out with a vigor and rigor quite unwarranted by the amount of evidence upon which they rest, and his deficiency as a commentator in ideality and religious sympathy sometimes almost approaches the ludicrous.

HOACTZIN, or **HOATZIN**, a bird of tropical South America, thought by Buffon to be that indicated by Hernandez or Fernandez under these names, the *Opisthocomus hoazin* or *O. cristatus* of modern ornithologists—a very curious and remarkable form, which has long exercised the ingenuity of classifiers.

The Hoactzin appears to be about the size of a small pheasant, but is really a much smaller bird. The beak

is strong, curiously denticulated along the margin of the maxilla near the base, and is beset by diverging bristles. The eyes, placed in the middle of a patch of bare skin, are furnished with bristly lashes, resembling those of hornbills and some few other birds. The head bears a long pendent crest of loose yellowish feathers. The body is olive-colored, varied with white above, and beneath is of a dull bay. The wings are short and rounded. The tail is long, and tipped with yellow. The legs are long, the feet stout, the tarsi reticulated, and the toes scutellated; the claws long and slightly curved. According to all who have observed the habits of this bird, it lives in bands on the lower trees and bushes bordering the streams and lagoons, feeding on leaves and various wild fruits. It exhales a very strong odor—wherefore it is known in British Guiana as the "Stink-bird."

HOADLY, BENJAMIN, bishop of Winchester, was the second son of the Rev. Samuel Hoadly, and was born at Westerham, Kent, November 14, 1676. His first appearance as a controversialist was against Mr. Calamy in reference to conformity, and immediately after this he engaged in a more important dispute with Bishop Atterbury against the Anglican doctrine of nonresistance. His principal treatises on this subject were the *Measures of Submission to the Civil Magistrate* and *The Origin and Institution of Civil Government Discussed*. He died at his palace at Chelsea, April 17, 1761.

HOARE, SIR RICHARD COBB, Bart., English antiquary, eldest son of Sir Richard Hoare, the first baronet, an eminent banker, was born December 9, 1758. Hoare died at Stourhead, May 19, 1838.

HOBART TOWN, sometimes wrongly **HOBARTOWN** or **HOBARTON**, the capital of Tasmania (named by its founder, Colonel Collins, February 19, 1804, in honor of Lord Hobart, then secretary of state for the colonies), is situated in the south of the island. It occupies a succession of hills along a sheltered bight on the western bank of the Derwent river, known as Sullivan's Cove, about seventeen miles from the ocean. The city proper, forming nearly a square, and laid out in wide streets intersecting at right angles, has an area of 1,270 acres, and contains about 10,000 houses, with a population estimated (1901) at 24,654.

HOBBEA, MEYNDER, the greatest landscape painter of the Dutch school after Ruysdael, lived at Amsterdam in the second half of the seventeenth century. His merit has been but recently recognized, whence the obscurity in which his life remains. Nothing is more disappointing than to find that in Hobbema's case chronology and signed pictures substantially contradict each other. According to the latter his practice lasted from 1650 to 1689; according to the former his birth occurred in 1638, his death as late as 1709.

The best of Hobbema's pictures are those of the years 1663 to 1667. Of the former several in the galleries of Brussels and St. Petersburg, and one in the Holford collection, are celebrated.

HOBBS, THOMAS, was born at Westport, in North Wilts, on Good Friday, April 5, 1588. He was educated at Oxford university, and spent the earlier years of his life as companion or tutor to a son of Lord Hardwick.

After several journeys abroad in the capacity of tutor to young noblemen Hobbes came home, in 1637, to a country seething with discontent. The reign of "Thorough" was collapsing, and the forces pent up since 1629 were soon to rend the fabric of the English state to pieces. In February Hampden's case began to be tried; in July broke out the Edinburgh riot over Laud's prayer-book; next year was formed the Solemn

League and Covenant; the year after the rebel Scots had the king at their mercy in the open field; and finally in the spring of 1640, with a new prospect of war, Charles had no resource left but once more, after eleven years of personal rule, to call a parliament. Such a rush of events was but too likely to overpower Hobbes' resolution to work up to social problems from abstract questions of body and space and motion, and there is clear evidence that he was soon distracted from the orderly execution of his philosophic plan. It can be proved that at this time he had written not only his *Human Nature* but also his *De Corpore Politico*, the two treatises, though published separately ten years later, having been composed as parts of one work. We are therefore to understand, first, that he wrote the earliest draft of his political theory some years before the outbreak of the Civil War, and, secondly, that this earliest draft was not written till, in accordance with his philosophical conception, he had established the grounds of polity in human nature.

When, in six months more, the Long Parliament succeeded to the Short, and set to work at once by sending Laud and Strafford to the Tower, Hobbes, who had become, or thought he had become, a marked man by the circulation of his treatise, instantly took fright and hastened away to Paris. He was now for the fourth and last time abroad, and did not see England again for eleven years.

Meanwhile Hobbes, however eager he might be to keep himself abreast of the general philosophical movement of the time, had his thoughts too full of the political theory which the rush of events in the last years had ripened within him, to be able to settle, even in Paris, to the orderly composition of his systematic works. Though connected in his own mind with his view of human nature, and of nature generally, the political theory, as he always declared, could stand by itself. Also, while he may have hoped at this time to be able to add much (though he never did add much) to the first popular sketch of his doctrine of Man, he might extend, but could hardly otherwise modify, the sketch he had there given of his carefully articulated theory of Body Politic. Possibly, indeed, before that sketch was written, early in 1640, he may, under pressure of the political excitement, have advanced no small way in the actual composition of the treatise *De Cive*, the third section of his projected system. In any case, it was upon this section, before the others, that he set to work as soon as he was fixed in Paris; and before the end of 1641 the book, as we know from the date of the dedication (November 1st), was finished.

The Civil War had broken out in the middle of 1642, and, after a period of varying fortunes on either side, the royalist cause began to decline from the time of the defeat of the marquis of Newcastle at Marston Moor, in the middle of 1644. Then commenced an exodus of the king's friends. The sight of these exiles, from whom he learned all the details of the fierce work that had been going on in England while he was quietly busy with his studies in Paris, made the political interest once more predominant in Hobbes, and before long the revived feeling issued in the formation of a new and important design. It first showed itself in the publication of the *De Cive*, of which the fame, but only the fame, had extended beyond the inner circle of friends and critics who had copies of the original impression. Hobbes now intrusted it, early in 1646, to his admirer, the Frenchman Sobière, by whom it was seen through the Elzevir press at Amsterdam in 1647—having previously inserted a number of notes in reply to objections, and also a striking preface, in the course of which he explained its relation to the other parts of

the system not yet forthcoming, and the (political) occasion of its having been composed and being now published before them. So hopeless, meanwhile, was he growing of being able to return home that, later on in the year, he was on the point of leaving Paris to take up his abode in the south with a French friend, when he was induced to remain as mathematical instructor to the young prince of Wales, who had come over from Jersey about the month of July. Thus thrown more than ever into the company of the exiled royalists, it was then, if not earlier, that he conceived his new design of bringing all his powers of thought and expression to bear upon the production of an English book that should set forth his whole theory of civil government in relation to the stupendous political crisis resulting from the war. The *De Cive*, presently to be published, was written in Latin for the learned, and gave the political theory without its foundation in human nature. The unpublished treatise of 1640 contained all or nearly all that he had to tell concerning human nature, but was written before the terrible events of the last years had disclosed how men might still be urged by their anti-social passions back into the abyss of anarchy. There was need of an exposition at once comprehensive, incisive and popular. The State, it now seemed to Hobbes, might be regarded as a great artificial man or monster (*Leviathan*), composed of men, with a life that might be traced from its generation through human reason under pressure of human needs to its dissolution through civil strife proceeding from human passions. This, we may suppose, was the presiding conception from the first, but the design may have been variously modified in the three or four years of its execution. Before the end, in 1650-51, it is plain that he wrote in direct reference to the greatly changed aspect of affairs in England. The king being no more, and the royalist cause appearing to be hopelessly lost, he did not scruple, in closing the work with a general "Review and Conclusion," to raise the question of the subject's right to change allegiance when a former sovereign's power to protect was irrecoverably gone. Also he took advantage of the lax rule of the Commonwealth to indulge much more freely than he might have otherwise dared in rationalistic criticism of religious doctrines; while, amid the turmoil of sects, he could the more forcibly urge that the preservation of social order, when again firmly restored, must depend on the assumption by the civil power of the right to wield all sanctions, supernatural as well as natural, against the pretensions of any clergy, Catholic, Anglican or Presbyterian, to the exercise of an *imperium in imperio*. We know the *Leviathan* only as it finally emerged from Hobbes' pen. During the years of its composition he remained in or near Paris, at first in attendance on his royal pupil, with whom he became a great favorite. The engagement must in any case have come to an end in the year 1648, when the prince removed to Holland, but it was probably broken off earlier by an illness that overtook Hobbes in 1647 and disabled him for six months. On recovering from this illness, which nearly proved fatal, he resumed his literary task, and carried it steadily forward to completion by the year 1650, having also within the same time translated into English, with characteristic force of expression, his Latin treatise. Otherwise the only thing known (from one or two letters) of his life in those years is that from the year 1648 he had begun to think of returning home; he was then sixty, and might well be weary of exile.

Though Hobbes came back after his eleven years' absence, without having as yet publicly proved his title to rank with the natural philosophers of the age, he

was sufficiently conscious of what he had been able to achieve in *Leviathan*; and it was in no humble mood that he now, at the age of sixty-four, turned to complete the fundamental treatise of his philosophical system. Neither were those whom his masterpiece soon roused to enthusiasm, or those whom it moved to indignation, likely to be indifferent to anything he should now write, whether it lay near to or far from the region of practice. Taking up his abode in London on his return, and continuing to reside there for the sake of intellectual society, he worked so steadily upon the materials he had long had by him as to be printing the *De Corpore* in the year 1654. Circumstances, however, kept the book back till the following year, and meanwhile the readers of *Leviathan* had a different excitement. In 1654 a small treatise, *Of Liberty and Necessity*, issued from the press, claiming to be an answer to a discourse on the same subject by Bishop Bramhall of Londonderry, addressed by Hobbes to the marquis of Newcastle. It was really such, and had grown out of an oral discussion between Hobbes and Bramhall in the marquis' presence at Paris in 1646,—Bramhall, a strong Arminian, having afterward written down his views and sent them to Newcastle to be answered in this form by Hobbes, and Hobbes having duly replied, but not for publication, because he thought the subject a delicate one. Unpublished, accordingly, the piece remained; but it happened that Hobbes, in the interval between writing his own reply and receiving from the bishop in 1647 a rejoinder which he left unanswered, allowed a French acquaintance to have a private translation of his reply made by a young Englishman, who secretly took also a copy of the original for himself; and now it was this unnamed purloiner who, in 1654, when Hobbes had become famous and feared, gave it to the world of his own motion, with an extravagantly laudatory epistle to the reader in its front. Upon Hobbes himself the publication came as a surprise, but after his plain speaking in *Leviathan*, there was nothing in the piece that he need scruple to have made known, and he seems to have readily enough condoned the offender's act. On the other hand, Bramhall, supposing Hobbes privy to the publication, might well resent the manner of it, especially as no mention was made of his rejoinder. Accordingly, in 1655, he printed everything that had passed between them (under the title of *A Defense of the True Liberty of Human Actions from Antecedent or Extrinsic Necessity*), with loud complaint against the treatment he had received, and the promise added that, in default of others, he himself would stand forward to expose the deadly principles of *Leviathan*. About this time Hobbes had begun to be hard pressed by other foes, and, being never more sure of himself than upon the question of the will, he appears to have welcomed the opportunity thus given him of showing his strength. By 1656 he was ready with his *Questions concerning Liberty, Necessity, and Chance*, in which he replied with astonishing force to the bishop's rejoinder point by point, besides explaining the occasion and circumstances of the whole debate, and reproducing all the pieces from the beginning.

We must now turn back to trace the fortunes of Hobbes and his other doings in the last twenty years of his life. All these controversial writings on mathematics and physics represent but one-half of his activity after the age of seventy; though, as regards the other half, it is not possible, for a reason that will be seen, to say as definitely in what order the works belonging to the period were produced. From the time of the Restoration he acquired a new prominence in the public eye. No year had passed since the appearance of *Leviathan* without some indignant protest against

the influence which its trenchant doctrine was calculated to produce upon minds longing above everything for civil repose; but it was not until the old political order was set up again that "Hobbiism" became a fashionable creed, which it was the duty of every lover of true morality and religion to denounce. Friends and foes alike were impressed by the king's behavior to the aged philosopher. Two or three days after Charles' arrival in London, Hobbes, who had come up to town from spending the previous winter in Derbyshire, drew in the street the notice of his former pupil, and was at once received into favor. The young king, if he had ever himself resented the apparent disloyalty of the "Conclusion" of *Leviathan*, had not retained the feeling long, and could well enough appreciate the principles of the great book when the application of them happened, as now, to be turned in his own favor. He had, besides, from of old a relish for Hobbes' lively wit, and did not like the old man the less because his presence at court scandalized the bishops or the prim virtue of Chancellor Hylce. He even went the length of bestowing on Hobbes (but not always paying) a yearly pension of £100, and had his portrait hung up in the royal closet. These marks of favor, naturally, did not lessen Hobbes' self-esteem, and perhaps they explain, in his later writings, a certain slavishness of feeling toward the regal authority, which is wholly absent from his rational demonstration of absolutism in the earlier works. At all events Hobbes remained very well satisfied with the rule of a king who had the sense to appreciate the author of *Leviathan*, and to protect him, when after a time protection in a very real sense became necessary. His eagerness to defend himself against Wallis' imputation of disloyalty, and his apologetic dedication of the *Problemata Physica* to the king, are evidences of the hostility with which he was being pressed as early as 1662; but it was not until 1666 that he felt himself seriously in danger. In that year the Great Fire of London, following in ominous succession on the Great Plague of the year before, roused the superstitious fears and intolerant passions of the people, and the House of Commons embodied the general feeling in a bill against atheism and profaneness. On October 17th it was ordered that the committee to which the bill was referred "should be empowered to receive information touching: such books as tended to atheism, blasphemy, and profaneness, or against the essence and attributes of God, and in particular the book published in the name of one White, and the book of Mr. Hobbes called the *Leviathan*, and to report the matter with their opinion to the House." What steps were taken before January 31st following, when the bill was read a third time and passed, does not appear; but Hobbes, then verging upon eighty, was greatly terrified at the prospect of being treated as a heretic, and proceeded to burn such of his papers as he thought might compromise him. At the same time he set himself, with a very characteristic determination, to inquire into the actual state of the law of heresy. The results of his investigation were first announced in three short Dialogues added (in place of the old "Review and Conclusion," for which the day had passed) as an Appendix to his Latin translation of *Leviathan*, included with the general collection of his works published at Amsterdam in 1668. In this appendix, as also in the posthumous tract, published in 1680, *An Historical Narration Concerning Heresy and the Punishment thereof*, he aimed at showing that, since the High Court of Commission had been put down, there remained in England no court of heresy at all to which he was amenable, and that even when it stood nothing was to be declared heresy but what was at variance

with the Nicene Creed, as he maintained the doctrine of *Leviathan* was not.

The only consequence that came of the parliamentary scare was that Hobbes could never afterward get permission to print anything on subjects relating to human conduct. The collected edition of his Latin works (in two quarto volumes) appeared at Amsterdam in 1668, because he could not obtain the censor's license for its publication at London, Oxford, or Cambridge. Other writings which he had finished, or on which he must have been engaged about this time, were not made public till after his death—the king apparently having made it the price of his protection that no fresh provocation should be offered to the popular sentiment. The most important of the works composed toward 1670, and thus kept back, is the extremely spirited dialogue to which he gave the title *Behemoth: the History of the Causes of the Civil Wars of England and of the Counsels and Artifices by which they were carried on from the year 1640 to the year 1660*. To the same period probably belongs the unfinished *Dialogue between a Philosopher and a Student of the Common Laws of England*, a trenchant criticism of the constitutional theory of English government as upheld by Coke. Aubrey takes credit for having tried to induce Hobbes to write upon the subject in 1664 by presenting him with a copy of Bacon's *Elements of the Laws of England*, and though the attempt was then unsuccessful, Hobbes later on took to studying the statute-book, with *Coke upon Littleton*. One other posthumous production (besides the tract on Heresy before mentioned) may also be referred to this, if not, as Aubrey suggests, an earlier time—the two thousand and odd elegiac verses into which he amused himself by throwing his view of ecclesiastical encroachment on the civil power; the quaint verses, disposed in his now favorite dialogue-form, were first published, nine years after his death, under the title *Historia Ecclesiastica*, with a preface by Thomas Rymer.

For some time Hobbes was not even allowed to utter a word of protest, whatever might be the occasion that his enemies took to triumph over him. In 1669 he had silently to bear the spectacle of an unworthy follower—Daniel Scargil by name, a fellow of Corpus Christi at Cambridge—made to act an edifying part in a public recantation of his principles after having brought them into discredit by offensively supporting them in the public schools. A few years later, in 1674, he had another experience of academic disfavor when Dr. John Fell, the dean of Christ Church, who bore the charges of the Latin translation of Anthony Wood's *History and Antiquities of the Universities of Oxford* (1670), struck out all the complimentary epithets in the account of his life, and substituted very different ones; but this time the king did suffer him to defend himself by publishing a dignified letter, to which Fell replied by adding to the translation when it appeared a note full of the grossest insults. And, amid all his troubles, Hobbes was not without his consolations. No Englishman of that day stood in the same repute abroad, and foreigners, noble or learned, who came to England, never forgot to pay their respects to the old man, whose vigor and freshness of intellect no progress of the years seemed able to quench.

His pastimes in the latest years were as singular as his labors. The autobiography in Latin verse, with its playful humor, occasional pathos, and sublime self-complacency, was thrown off at the age of eighty-four. At eighty-five, in the year 1673, he sent forth a translation of four books of the *Odyssey* (ix.—xii.) in rugged but not seldom happily turned English rhymes; and, when he found this *Voyage of Ulysses* eagerly received, he had ready by 1675 a complete translation of both *Iliad* and *Odyssey*, prefaced by a lively dissertation "Con-

cerning the virtues of an heroic poem," showing his unabated interest in questions of literary style. In that year (1675) he ceased coming to London, and thenceforth passed his time at his patron's seats in Derbyshire, always occupied to the last with some intellectual work in the early morning and in the afternoon hours, which it had long been his habit to devote to thinking and to writing. With such tenacity did he cling to his pursuits (always systematically keeping up exercise for the sake of health) that even as late as August, 1679, he was promising his publishers "somewhat to print in English." The end came very soon afterward. A suppression of urine in October, in spite of which he insisted upon being conveyed with the family from Chatsworth to Hardwick Hall toward the end of November, was followed by a paralytic stroke, under which he sank on December 4th, in his ninety-second year. He lies buried in the neighboring parish church of Hault Hucknall.

HOBOKEN, a city and port of entry of New Jersey, is situated in Hudson county, on the west bank of the Hudson river, opposite the city of New York. Jersey City, with which the town is connected by lines of street cars, lies not far distant, and constant communication with New York city is kept up by means of steam ferry-boats. Several other neighboring towns also have lines of horse cars and other vehicles which afford easy and convenient transit to and from Hoboken. The most important branch of business carried on in the city is the coal trade, from which the shipping of the neighboring ports as well as the inhabitants of New York city draw their chief supply. Several lines of railway center here, giving the city overland connection with all sections of the continent, while ocean steamships ply between this point and various foreign and coastal ports. Some manufactures are carried on, and the commerce of the city is extensive and growing in importance. Its banking and telegraph facilities are good, while its contiguity with New York affords every convenience for the transaction of almost every kind of business. There are numerous churches, the principal denominations having vigorous organizations, and buildings furnishing sittings ample in their accommodations. In addition to the common school system there are several institutions for higher education, and an institute of technology, well equipped and sustained.

The municipal government consists of a mayor, clerk, treasurer, collector of revenue, corporation attorney, comptroller, water registrar, city physician, street commissioner, overseer of poor, assessor, and eight councilmen (two from each of the four wards of the city). The industries of Hoboken continue to grow, the number of manufacturing establishments in 1900 being 399, with an aggregate capital of \$8,331,015. The number of wage-earners was 6,443; wages, \$3,076,235; value of year's products, \$12,092,872.

The school system is represented as follows: five school buildings, occupied by the grammar, ungraded, and one high school, with a school library of 1,200 volumes. School receipts for year, \$93,252.84; expenditures, \$92,260.99, giving tuition to an enrollment of 6,077 pupils out of a total school population of 13,452. The town has an efficient fire department, consisting of four steamer companies, three hose companies, two hook and ladder companies, together with their proper officers, and has in addition a good system of police and fire alarm telegraph. The police department consists of a chief, three aids, four roundsmen, two detectives, fifty patrolmen, and forty-six substitutes, and was maintained last year at a cost of \$57,789.93. The water supply of the city is excellent, and was maintained during this last fiscal year at a cost of

\$113,868.74, returning a revenue of \$114,072.07 (including appropriation for that department). The city is lighted by gas and electricity, and has a good system of charities, and an excellent hospital. Its population numbered (1900) 59,364.

HOCHE, LAZARE, a French general of the time of the Revolution, was born of poor parents at Montrenil near Versailles, June 25, 1768. Having risen to the rank of sergeant, he, at the outbreak of the Revolution, made an important stand with a mere handful of troops against a large body of insurgents; and it was he also who, at a later period, defended the entrance to the chamber of the queen when her apartments were invaded by a revolutionary mob. He distinguished himself at the siege of Thionville in 1792, and at the battle of Neerwinden, March 13, 1793. Shortly afterward he received the brevet of general of brigade, and was appointed to the command of Dunkirk, for his brilliant defense of which against the duke of York he received the chief command of the army of Moselle. Shortly afterward he was assigned the chief command by the representatives of the people with the two armies, but, this promotion awakening the morbid suspicion of Robespierre, he was recalled and thrown into prison, and it was only the timely fall of Robespierre that saved him from the guillotine. Afterward he was appointed to the command of an army organized for the conquest of Ireland. The expedition set sail from Brest, December 16, 1796, but was dispersed by a storm, scarcely one half of the vessels escaping shipwreck or capture. In the following year Hoche was sent to the eastern frontier to act against Austria, and by a series of masterly maneuvers he succeeded in surrounding the army of General Kray, and but for a declaration of peace would have taken him and all his troops prisoners of war. Not long after his return he was appointed to the command of the united army in Germany, but eight days afterward he died suddenly at Wetzlar, September 18, 1797.

HODGE, CHARLES, theologian, was born in Philadelphia, December 28, 1797. He was educated at the college of New Jersey in Princeton, where he graduated in 1815, and afterward at the theological seminary of the Presbyterian Church in the same place. From 1835 to 1868 he wrote yearly an article reviewing the action of each general assembly, which series has exerted a powerful influence over the current opinion and history of the church to which he belonged. The most part of these have been republished in Great Britain and in America, in volumes, under the titles of *Hodge's Essays*, *Princeton Theological Essays* and *Hodge's Church Polity*. He was made doctor of divinity by Rutgers College, N. J., in 1834, moderator of the general assembly (O.S.) in 1846, member of the committee to revise the *Book of Discipline* of the Presbyterian Church in 1858, and LL.D. by Washington College, Penn., in 1864. He continued to instruct his classes uninterruptedly up to the time of his death in Princeton, June 10, 1878.

HODGKINSON, EATON (1789-1861), a distinguished English engineer, was the son of a farmer, and was born at Anderton, near Northwich, Cheshire, February 26, 1789. In 1840 Hodgkinson communicated a paper to the Royal Society on *Experimental Researches on the Strength of Pillars of Cast-iron and other Materials*, in recognition of which he in 1841 received the royal medal, and was also elected a fellow. His formulæ for solid and hollow pillars soon obtained general adoption in all engineering class-books. Subsequently he was employed by Stephenson to verify the experiments of Fairbairn on wrought-iron tubes, with a view to the construction of the Britannia Bridge; and

for his coöperation in this work he received a silver medal at the Paris Exhibition of 1855. In 1847 he was appointed professor of the mechanical principles of engineering in University College, London. In 1848 he was chosen president of the Manchester Philosophical Society, of which he had been a member since 1826, and to which, both previously and subsequently, he contributed many of the more important results of his discoveries. For several years he took an active part in the discussions of the Institution of Civil Engineers, of which he was elected an honorary member in 1851. He died at Eaglesfield House, near Manchester, June 18, 1861.

HÓDMÉZŐ-VÁSÁRHELY, a corporate town in the county of Csongrád, Hungary, is situated on the lake Hód, and on the Alföld Railway, about ninety miles southeast of Budapest. Population, (1900), 60,883.

HODOGRAPH is the name given to a geometrical construction which greatly facilitates the study of kinematical questions. It was invented by Sir William Rowan Hamilton about 1845, and the first account of it, written by him, is to be found in the *Proc. R. I. A.* for 1846.

The hodograph may be thus defined: If a point be in motion in any orbit and with any velocity, and if, at each instant, a line be drawn from a fixed point parallel and equal to the velocity of the moving point at that instant, the extremities of these lines will lie on a curve called the hodograph.

HODY, HUMPHREY, an English divine, was born at Odcombe in Somersetshire in 1659, and died in 1706.

HOF, originally **REGNITZHOFF**, a town of Bavaria, circle of Upper Franconia, is beautifully situated on the Saale, on the northeastern spurs of the Fichtelgebirge, and at the junction of several railways, thirty miles north-northeast of Baireuth. Pop. (1901), 32,782.

HOFFER, ANDREAS, a Tyrolese patriot, was born October 2, 1767, at St. Leonhardt, in the Passeyr valley. On the outbreak of the war in 1796, he commanded a company of riflemen against the French at Lake Garda, and after the peace of Lunéville he took an active part in organizing the Tyrolese militia. After the treaty of Presburg (1805), by which Tyrol was transferred from Austria to Bavaria, Hoffer was chosen a member of the secret Tyrolese deputation which went to Vienna to confer with the emperor on the condition of the country; and when, on the advice of Austria, the whole of Tyrol in April, 1809, rose in arms, Hoffer was chosen to the command of a large division of the insurgents, and inflicted an overwhelming defeat on the Bavarians at Sterzing. Reinforcements sent by Napoleon defeated the Austrians at Woerl and the Tyrolese at Feuersinger, but Hoffer coming to the rescue of his country repulsed the Bavarians with great loss at Innsbruck. Notwithstanding also that Austria after Napoleon's victory at Wagram agreed to evacuate Tyrol, Hoffer resolved to maintain the struggle, and on August 13th, at Berg Isel, routed with great slaughter a combined French and Bavarian force, and completely freed his country from foreign dominion. For some time the internal affairs of Tyrol were administered by an independent government of which Hoffer was the head, but after the peace of Vienna the Bavarians again began to assert their supremacy, and after a heroic resistance Hoffer was compelled to flee for safety to the mountains. A price was set upon his head, and on account of the treachery of one of his most trusted followers, he was captured January 27, 1810, in a chalet in Passeyr valley. He was sent to Mantua for trial, and on February 20, by orders of Napoleon, was executed twenty-four hours after his condemnation.

HOFFMANN, AUGUST HEINRICH, known as **Hoff-**

mann von Fallersleben, German poet, philologist, and historian of literature, was born at Fallersleben, in Lüneburg, April 2, 1798. In 1823 he was appointed librarian to the university of Breslau, a post which he held till 1838. He was made extraordinary professor of the German language and literature at the university in 1830, and full professor in 1835; but he was deprived of his chair in 1842 in consequence of his *Unpolitische Lieder*, which gave much offense to the ruling classes of Prussia. In 1860 he became librarian to the duke of Ratibor, and he retained this appointment till his death on January 20, 1874.

HOFFMANN, ERNST THEODOR WILHELM, German romance writer (for whose name Wilhelm, his own substitute, in homage to Mozart, was Amadeus), was born at Königsberg, January 24, 1776. In 1798 he became referendary in the supreme court at Berlin, and in 1800 passed his final examination and was appointed assessor to the court of Posen; but, in 1804, he was transferred as counselor to Warsaw. He soon became the center of musical society in Warsaw, but in the spring of 1807 he returned to Berlin. The editor of the *Allgemeine Musikalische Zeitung* enlisted his services, and in that paper appeared a series, afterward published, with a preface by Jean Paul Richter, as *Fantasiestücke in Callots Manier* (1814; 4th ed., 1864). He composed at this time, among other things, a *Miserere*, by order of the grand-duke of Würzburg, and, for the proprietors of the Bamberg theater, music to Kotzebue's opera *Das Gespenst*; and he also gave lessons in music and drawing, decorated saloons, and painted portraits to order. The money which he inherited at the death of his uncle did not suffice to pay his debts; and he had been reduced to selling his last coat for food when his friends obtained for him the post of musical director to another theatrical company, performing alternately at Dresden and Leipsic. Hoffmann was writing romances in a garret in Dresden, or bedridden by gout, was drawing caricatures of the "verwünschte Franzosen" while Napoleon and the allied armies were struggling round its walls. In 1814 appeared his *Vision auf der Schlachtfelde von Dresden*; and in the same year, on the fall of Napoleon, he returned to Berlin and was reinstated in the legal profession. Two years later he was appointed councillor in the supreme court, and from that time enjoyed a good income, a dignified position and the society of his best friends. He was already, in virtue of his *Fantasiestücke*, regarded as one of the most notable romance writers of his day, but most of his works were yet to come. These followed each other in quick succession. *Die Elixire des Teufels* appeared in 1816; *Nachtstücke* in 1817; *Seltene Leiden eines Theaterdirektors* in 1818; *Die Serapionsbrüder*, a collection of tales, in 1819-24; *Klein Zaches, genannt Zinnober*, in 1819; *Prinzessin Brambilla* in 1821; *Meister Floh* in 1822; and *Lebensansichten des Katers Murr* in 1821-22. He also composed the opera *Undine*, the libretto of which was prepared by Fouqué himself. It was performed with success in Berlin; but the music was lost in the subsequent destruction of the opera house by fire. He died at Berlin, July 24, 1822. *Der Feind*, his last work, remained unfinished.

HOFFMANN, FRIEDRICH, the most famous physician in a family that had been connected with medicine for 200 years before him, was born at Halle, February 19, 1660. At the age of eighteen he went to study medicine at Jena, whence in 1680 he passed to Erfurt. Next year, returning to Jena, he received his doctor's diploma, and, after publishing a thesis, was permitted to teach. Constant study then began to tell on his health, and in 1682, leaving his already numer-

ous pupils, he proceeded to Minden in Westphalia to recruit himself. After practicing his profession at Minden for two years, Hoffmann made a journey to Holland and England.

Toward the end of 1684 he returned to Minden, and during the next three years he received many flattering appointments. In 1688 he removed to the more promising sphere of Halberstadt, with the title of physician to the principality of Halberstadt; and on the founding of Halle university, in 1693, his reputation, which had been steadily increasing, procured for him the primarius chair of medicine, while at the same time he was charged with the responsible duty of framing the statutes for the new medical faculty. He filled also the chair of natural philosophy. With the exception of four years (1708-12), which he passed at Berlin in the capacity of royal physician, without, however, giving up his professorship, Hoffmann spent the rest of his life at Halle in instruction, practice, and study, interrupted now and again by visits to different courts of Germany, where his services procured him honors and rewards. He died at Halle, on November 12, 1742.

HOFFMANN, JOHANN JOSEPH, an eminent Chinese and Japanese scholar, was born at Würzburg on February 16, 1805. In 1875, in recognition of his profound scholarship, he was decorated with the order of the Netherlands Lion, and in 1877 he was elected corresponding member of the Berlin Academy. But these honors came almost too late; for a disease of the lungs from which he had long suffered terminated fatally on January 19, 1878.

HOFFMANN, JOHANN CHRISTIAN KONRAD VON, Lutheran theologian, was born December 21, 1810, at Nuremberg. His death occurred on December 20, 1877.

HOGARTH, WILLIAM. Apart from the story of his works, the life of the greatest English pictorial satirist, when divested of doubtful tradition, is singularly devoid of incident. Hogarth was born in London, November 10, 1697.

"His first employment" (*i. e.*, after he set up for himself) "seems," says Nichols, "to have been the engraving of arms and shop bills." After this he was employed in designing "plates for booksellers." Of these early and mostly insignificant works we may pass over *The Lottery*, an Emblematic Print on the South Sea, and some book illustrations, to pause at *Masquerades and Operas*, 1724, the first plate he published on his own account. In 1726 he prepared twelve large engravings for Butler's *Hudibras*. These he himself valued highly, and they are the best of his book illustrations. But he was far too individual to be the patient interpreter of other men's thoughts, and it is not in this direction that his successes are to be sought.

On March 23, 1729, he was married at old Paddington church to Jane Thornhill. The match was a clandestine one, although Lady Thornhill appears to have favored it. We next hear of him in "lodgings at South Lambeth," where he rendered some assistance to the then well-known Jonathan Tyers, who opened Vauxhall in 1732, with an entertainment styled a *ridotto al fresco*. For these gardens Hogarth painted a poor picture of Henry VIII. and Anna Bullen, and for them he also made some designs of the *Four Times of the Day*, which he afterward elaborated into a finished series. The only engravings between 1726 and 1732, which need be referred to, are the *Large Masquerade Ticket* (1727), another satire on masquerades, and the print of *Burlington Gate*, 1731, evoked by Pope's *Epistle to Lord Burlington*, and defending Lord Chandos, who is therein satirized. This print gave great offense, and was, it is said, suppressed. To 1732 belongs that genial journey from London to Sheerness,

of which the original record still survives at the British Museum.

In 1733 Hogarth moved into the "Golden Head" in Leicester Fields, which, with occasional absences at Lichfield, he continued to occupy until his death. By this date he must have completed the earliest of those great series of moral paintings which first gave him his position as a great and original genius. This was *A Harlot's Progress*, the paintings for which, if we may trust the date in the last of the pictures, were finished in 1731. The engravings, by the artist himself, were published in 1734.

The favorable reception given to *A Harlot's Progress* prompted *A Rake's Progress*, which speedily followed, although it had not a like success. It was in eight plates in lieu of six. The story is unequal; but there is nothing finer than the figure of the desperate rake in the Covent Garden gaming-house, or the admirable scenes in the Fleet prison and Bedlam, where at last his headlong career comes to its tragic termination. The plates abound with allusive suggestion and covert humor; but it is impossible to attempt any detailed description of them here.

A Rake's Progress was dated June 25, 1735, and the engravings bear the words "according to Act of Parliament." This was an act (8 Geo. II. cap. 13) which Hogarth had been instrumental in obtaining from the legislature, being stirred thereto by the shameless piracies of rival printsellers. Although loosely drawn, it served its purpose; and the painter commemorated his success by a long inscription on the plate entitled *Crowns, Miters, etc.*, afterward used as a subscription ticket to the Election series. These subscription tickets to his engravings, let us add, are among the brightest and most vivacious of the artist's productions. That to the *Harlot's Progress* was entitled *Boys Peeping at Nature*, while the *Rake's Progress* was heralded by the delightful etching known as *A Pleased Audience at a Play, or The Laughing Audience*.

We must pass more briefly over the prints which followed two *Progresses*, noting first *A Midnight Modern Conversation*, an admirable drinking scene which comes between them in 1734, and the bright little plate of *Southwark Fair*, which, though dated 1733, was published with *A Rake's Progress* in 1735. Between these and *Marriage à la Mode*, upon the pictures of which the painter must have been not long after at work, come the small prints of the *Consultation of Physicians*, *Scholars at a Lecture*, and *Sleeping Congregation*, 1736; the *Four Times of the Day*, 1738, a series of pictures of everyday eighteenth-century life; the *Strolling Actresses Dressing in a Barn*, 1738, and finally the admirable plates of the *Distrest Poet*, painfully composing a poem on "Riches" in a garret, and the *Enraged Musician* fulminating from his parlor window upon a discordant orchestra of knife-grinders, milk-girls, ballad-singers and the rest upon the pavement outside. These are dated respectively 1736 and 1741. To this period also (*i.e.*, the period preceding the production of the plates of *Marriage à la Mode*) belong two of those history pictures to which, in emulation of the Haymans and Thornhills, the artist was continually attracted. The *Pool of Bethesda* and the *Good Samaritan*, "with figures seven feet high," were painted circa 1736, and presented by the artist to St. Bartholomew's Hospital, where they remain. They were not masterpieces; and it is pleasanter to think of his connection with Captain Coram's recently established Foundling Hospital (1739), which he aided with his money, his graver and his brush, and for which he painted that admirable portrait of the good old philanthropist which is still, and deservedly, one of its chief ornaments.

The engravings of *Marriage à la Mode* were dated April, 1745. Although the painter by this time found a ready market for his engravings, he does not appear to have been equally successful in selling his pictures. The people bought his prints; but the more opulent and not numerous connoisseurs who purchased pictures were wholly in the hands of the importers and manufacturers of "old masters."

But, if Hogarth was not successful with his dramas on canvas, he occasionally shared with his contemporaries in the popularity of portrait painting. For a picture, executed in 1746, of Garrick as Richard III. he was paid £200, "which was more," says he, "than any English artist ever received for a single portrait." In the same year a sketch of Simon Fraser, Lord Lovat, afterward beheaded on Tower Hill, had an exceptional success. Our limits do not, however, enable us to refer to his remaining works in detail, and we must content ourselves with a brief enumeration of the most important. These are *The Stage Coach, or Country Inn Yard*, 1747; the series of twelve plates entitled *Industry and Idleness*, 1747, depicting the career of two London apprentices; the *Gate of Calais*, 1749, which had its origin in a rather unfortunate visit paid to France by the painter after the peace of Aix-la-Chapelle; the *March to Finchley*, 1750; *Beer Street*, *Gin Lane*, and the *Four Stages of Cruelty*, 1751; the admirable representations of election humors in the days of Sir Robert Walpole, entitled *Four Prints of an Election*, 1755-8; and the plate of *Credulity, Superstition, and Fanaticism*, a *Medley*, 1762, adapted from an earlier unpublished design called *Enthusiasm Delimited*. Besides these must be chronicled three more essays in the "great style of history painting," *viz.*, *Paul before Felix*, *Moses brought to Pharaoh's Daughter*, and the *Altarpiece* for St. Mary Redcliff at Bristol. The first two were engraved in 1751-2, the last in 1794. A subscription ticket to the earlier pictures, entitled *Paul before Felix Burlesqued*, had a popularity far greater than that of the prints themselves.

In 1745 Hogarth painted that admirable portrait of himself with his pug-dog Trump, which is now in the National Gallery. In a corner of this he had drawn on a palette a serpentine line with the words "The Line of Beauty and Grace." Much inquiry ensued as to "the meaning of this hieroglyphic;" and in an unpropitious hour the painter resolved to explain this meaning in writing. The result was the well-known *Analysis of Beauty*; 1753, a treatise "to fix the fluctuating ideas of Taste," otherwise a desultory essay having for pretext the precept attributed to Michelangelo that a figure should be always "Pyramidical, Serpent-like, and multiplied by one two and three." In 1759 the success of a little picture called *The Lady's Last Stake*, painted for Lord Charlemont, procured him a commission from Sir Richard Grosvenor to paint another picture "upon the same terms." Unhappily on this occasion he deserted his own field of *genre* and social satire, to select the story from Boccaccio (or rather Dryden) of Sigismonda weeping over the heart of her murdered lover Guiscardo, being the subject of a picture by Furini in Sir Luke Schaub's collection which had recently been sold for £400. The picture, over which he spent much time and patience, was not regarded as a success.

In 1761 he was sixty-five years of age, and he had but three years more to live. These three years were embittered by that unhappy quarrel with Wilkes and Churchill, over which most of his biographers are contented to pass rapidly. Having succeeded John Thornhill in 1757 as serjeant painter (to which post he was reappointed at the accession of George III.) an evil genius prompted him in 1762 to do some "timed" thing

in the ministerial interest, and he accordingly published the indifferent satire of *The Times*, plate i. This at once brought him into collision with his quondam friends, John Wilkes and Churchill the poet; and the immediate result was a violent attack upon him, both as a man and an artist, in the opposition *North Briton*, No. 17. The alleged decay of his powers, the miscarriage of Sigismonda, the cobbled composition of the *Analysis*, were all discussed with scurrilous malignity by those who had known his domestic life and learned his weaknesses. The old artist was deeply wounded, and his health was failing. Early in the next year, however, he replied by that squinting portrait of Wilkes which will forever carry his features to posterity. Churchill retaliated in July by a savage *Epistle to William Hogarth*, to which the artist rejoined by a print of Churchill as a bear, in torn bands and ruffles, not the most successful of his works. "The pleasure and pecuniary advantage," writes Hogarth, "which I derived from these two engravings" (of Wilkes and Churchill), "together with occasional riding on horseback, restored me to as much health as can be expected at my time of life." He produced but one more print, that of *Finis*, or *The Bathos*, March, 1764, a strange jumble of "fag ends" intended as a tailpiece to his collected prints; and on October 26th of the same year he died of an aneurism at his house in Leicester Square. His wife, to whom he left his plates as a chief source of income, survived him until 1789.

HOGG, JAMES (1770-1835), a Scottish poet, best known by his title of the "Ettrick Shepherd," was born on the banks of the Ettrick in Selkirkshire in 1770. While attending to his flock, he spent a great deal of time in reading. His first printed piece was "The Mistakes of a Night," which appeared in the *Scots Magazine* for October, 1794, and was succeeded by *Scots Pastorals* in 1801. A year or two after this publication Hogg became acquainted with Sir Walter Scott—a connection which had a powerful influence for good on the peasant poet. He again appeared before the public in 1807 as the author of the *Mountain Bard*, to which Scott wrote an introductory notice. The appearance of the *Queen's Wake* in 1813 established Hogg's reputation as a poet; it was followed by *Mador of the Moor*, *The Pilgrims of the Sun*, and *The Poetic Mirror*. The duchess of Buccleuch, on her death-bed in 1814, had asked the duke to do something for the Ettrick bard; and the duke gave him a lease for life of the farm of Altrive in Yarrow, consisting of about seventy acres of moorland, on which the poet built a house and spent the last years of his life. He took possession of it in 1817; but his literary exertions were never relaxed. Before 1820 he had written *The Broonie of Bodsbeck*, and two volumes of *Winter Evening Tales*, besides collecting, editing, and writing part of two volumes of *Jacobite Relics*, and contributing largely to *Blackwood's Magazine*. With his pen in his hand to the last, Hogg in 1834 published a volume of *Lay Sermons*, and in 1835 two volumes of *Montrose Tales*. His illness ultimately assumed the form of dropsy, and after a short confinement he died November 21, 1835, having nearly completed his sixty-fifth year.

HOHENELBE, the chief town of a government district in Bohemia, is beautifully situated on both banks of the Elbe, crossed there by five bridges, on the southern spurs of the Riesengebirge, and on the north-west Austrian railway, sixteen miles northeast of Gitschin.

HOHENLOHE, a German princely family, who took their name from the territory of Hohenlohe, in Franconia, which, originally a countship and afterward a principality, lost its independence in 1806, and is now

included partly in Württemberg and partly in Bavaria. They are first mentioned as possessing in the twelfth century the castle of Holloch near Uffenheim. At an early period they extended their influence into several of the Franconian valleys, including those of the Kocher, the Jagst, the Tauber, and the Gotlach. The first count of the name was Gottfried, who was on terms of intimacy with the emperor Henry VI., and whose sons founded the lines of Hohenlohe-Bruneck and Hohenlohe-Holloch. The former became extinct in the fourth generation, and the latter in 1340 divided into the lines of Hohenlohe-Hohenlohe and Hohenlohe-Speckfeld. Of these the former became extinct in 1412, after the most of the possessions had been alienated through the marriage of the female heir; and the latter in 1551 divided into the present lines of Hohenlohe-Neuenstein and Hohenlohe-Waldenburg, which were elevated, the former in 1764 and the latter in 1744, to principalities of the empire. Hohenlohe-Neuenstein, which adopted Protestantism, became divided into the lines Hohenlohe-Neuenstein-Oehringen and Hohenlohe-Neuenstein-Langenburg, the former of which separated into the branches of Hohenlohe-Weickersheim and Hohenlohe-Oehringen, the one becoming extinct in 1756 and the other in 1805, after which their possessions were inherited by the Hohenlohe-Neuenstein-Langenburg line, which latter became divided into three branches—the Hohenlohe-Langenburg, the Hohenlohe-Langenburg-Oehringen, and the Hohenlohe-Langenburg-Kirchberg, the last becoming extinct in 1861. The line of Hohenlohe-Waldenburg, which remained Catholic, and in which was established in 1754 the order of the Phoenix, divided itself into two branches, the Hohenlohe-Waldenburg-Bartenstein and the Hohenlohe-Waldenburg-Schillingsfürst, the former subdividing into the branches of Hohenlohe-Bartenstein and Hohenlohe-Jagstberg.

HOHENMAUTH, the chief town of a government district in Bohemia, Austria, is situated on the Lautchna, and on the Austrian States Railway sixteen miles east of Chrudim.

HOHENSTEIN, a town of Saxony, circle of Zwickau, stands on the slopes of the Erzgebirge, and on the Saxon States railway, twelve miles northeast of Zwickau. Since 1875 Ernstthal has been included within its limits.

HOHENZOLLERN, an old German princely house, from which the present dynasty of Prussia is descended, takes its name from the old castle of Zollern, or Hohenzollern, on the mountain of Zollern, about one and a half miles south from Hechingen. There is a vague tradition connecting the house with the Colonna family of Rome, or the Colalto family of Lombardy, and a more definite one which mentions a Swabian count, Thassilo of Burchardinger, as having built the castle of Zollern about the beginning of the ninth century. The first counts of Zollern of whom there is historical mention are Burchard and Wezel, apparently brothers, who in 1061 fell in one of the party feuds during the minority of the emperor Henry IV. Count Frederick III. of Zolre, who died in 1200, one of the trusted counselors of the emperors, Frederick I. and Henry VI., became count of Nuremberg in 1191, through having married the heiress of Count Conrad II. of Nuremberg. His sons, Conrad III. and Frederick IV., succeeded to the joint possession of his titles and estates, and founded respectively the Frankish and the Swabian lines. The Frankish house steadily and uninterruptedly increased its possessions and its influence; in 1363 it was raised to princely rank in the person of Frederick V.; in 1415 it obtained through Frederick VI. the electorate of Brandenburg from the emperor Sigis-

mund; and in 1701 its head, the elector Frederick III., became the first king of Prussia. The influence of the Swabian line was greatly weakened by partitions, but in the beginning of the sixteenth century it rose to some eminence through Count Eitel Frederick II., privy counselor of the emperor Maximilian I., who received from the emperor the district of Hargerloch in exchange for Rhäzüns, in the Grisons, which had come into his family by marriage. His grandson, Charles I, received in 1529 from the emperor, Charles V., the countships of Sigmaringen and Vöhringen. Eitel Frederick III. and Charles II. divided their states, the former taking Hohenzollern with the title Hohenzollern-Hechingen, the latter Sigmaringen and Vöhringen with the title Hohenzollern-Sigmaringen. Count John George of Hohenzollern-Hechingen son of Eitel Frederick III., was raised to princely rank by the emperor Ferdinand II. in 1623, and John of Hohenzollern-Sigmaringen received the same honor in 1638. In 1695 the two Swabian branches entered conjointly into an agreement with the Brandenburg line that, in case of the extinction of the male line of either of the Swabian branches, the states should be inherited by the other branch, and that if both branches became extinct the states should be inherited by the Brandenburg line. In consequence of the political troubles of 1848, Prince Frederick William of Hohenzollern-Hechingen, and Charles Anton of Hohenzollern-Sigmaringen resigned their principalities, which consequently fell to the crown of Prussia, by whom they were taken possession of, March 12, 1850. By royal decree of May 20th of the same year the title of highness was conferred on the two princes, with the prerogatives of younger sons of the royal house. The proposal to raise Prince Leopold of Hohenzollern-Sigmaringen to the throne of Spain in 1870 was the immediate occasion of the war between France and Germany. In 1852 the lands of Hohenzollern were formed into an administrative division of Prussia. It is composed of a long narrow strip of land bounded on the northeast and west by Würtemberg and on the west and south by Baden, with an area of 440 square miles, and a population in 1875 of 66,614. During the reign of the Prussian kings of this house, beginning with Frederick I., in 1701, much of the history of Germany has been made. From the time that the Brandenburg branch of the Hohenzollerns claimed the royal sovereignty of Prussia, that state has steadily augmented in power and importance, until in 1871, after the overthrow of the French empire, and the redress of the grievances of the collateral line of Hohenzollerns, it became the nucleus and leading state of the German empire as at present constituted, and the king of Prussia took the additional dignity of hereditary emperor of Germany. There have thus been in modern times three German emperors of this dynasty, Wilhelm I., Frederick III., and the present emperor, Wilhelm II.

HOLBACH, PAUL HEINRICH DIETRICH, BARON D', *philosophe* of the Parisian school of the eighteenth century, was born at Heidelheim in the palatinate in 1723. Much of Holbach's fame is due to his intimate connection with the brilliant coterie of bold thinkers and polished wits whose creed, the new philosophy, is concentrated in the famous *Encyclopédie*.

Although an atheist, or at least a materialist of the most material school, Holbach seems to have been endowed with a more than average share of virtue, and, whether by his courtesy, gentleness, or benevolence, inspired a warm affection in all he met. Even his failings, of which his simple credulity was perhaps the most prominent, were amiable. He was one of the best informed men of his day, and his excellent memory placed at his immediate disposal all the learning he had

amassed. He published his books either anonymously or under a borrowed name, and was forced to have them printed out of France. He died in 1789.

HOLBEIN, HANS, the elder, belonged to a celebrated family of painters in practice at Augsburg and Basel from the close of the fifteenth to the middle of the sixteenth century.

The elder Holbein was a prolific artist, who left many pictures behind him. Earlier than the celebrated Basilica of St. Paul, is the Basilica of St. Mary Magdore, and a Passion in eleven pieces, in the Augsburg gallery, both executed in 1499. Another Passion, with the root of Jesse and a tree of the Dominicans, is that preserved in the Stadel, Saalhof, and church of St. Leonard at Frankfurt. It was executed in 1501. The Passion of Donaueschingen was finished after 1502, in which year was completed the Passion of Kaisheim, a conglomerate of twenty-seven panels, now divided among the galleries of Munich, Nuremberg, Augsburg, and Schleissheim. An altarpiece of the same class, commissioned for the monastery of St. Moritz, at Augsburg in 1504-8, has been dispersed and lost. The year 1512 is the date of a Conception in the Augsburg gallery, long assigned, in consequence of a forged inscription, to Hans Holbein the younger. A diptych, with a Virgin and Child, and a portrait of an old man, dated 1513, is in separate parts in the collections of Mr. Posonyi and Count Lanckoronski at Vienna. The sketchbooks of Berlin, Copenhagen, and Augsburg give a lively picture of the forms and dress of Augsburg residents at the beginning of the sixteenth century. They comprise portraits of the emperor Maximilian, the future Charles V., Kuiz von der Rosen, the fool of Maximilian, the Fuggers, friars, merchants, and at rare intervals ladies.

HOLBEIN, HANS, the younger, favorite son of Hans Holbein the elder, was probably born at Augsburg about the year 1497. About 1515 he left Augsburg with Ambrose his elder brother to seek employment as an illustrator of books at Basel. His first patron is said to have been Erasmus. Hans, not overburdened with practice, wandered into Switzerland, where (1517) he was employed to paint in the house of Jacob Hertenstein at Lucerne. In 1519 Holbein reappeared at Basel, where he matriculated, and, there is every reason to think, married. Holbein settled down to an extensive practice at Basel in 1519. His versatility at this period is shown by a dead Christ (1521), a corpse in profile on a dissecting table, and a set of figures in couples; the Madonna and St. Pantalus, and Kaiser Henry with the empress Kunigunde (1522), originally composed for the organ loft of the Basel cathedral, now in the Basel museum. Equally remarkable, but more attractive, though injured, is the Virgin and Child between St. Ursus and St. Nicholas (not St. Martin) giving alms to a beggar, in the gallery of Solothurn. This remarkable picture is dated 1522. The promise which he gave at this time was immense. He was gaining a freedom in draughtmanship that gave him facility to deal with any subject. Though a realist, he was sensible of the dignity and severity of religious painting. His color had almost all the richness and sweetness of the Venetians. But he had fallen on evil times, as the next few years undoubtedly showed.

Once only, after 1526, and after he had produced the *Lais* and *Venus and Amor*, did Holbein with impartial spirit give his services and pencil to the Roman Catholic cause. The burgomaster Meyer, whose patronage he had already enjoyed, asked him to represent himself and his wives and children in prayer before the Virgin; and Holbein produced the celebrated altarpiece now in the palace of Prince William of Hesse at Darm-

stadt, the shape and composition of which are known to all the world by its copy in the Dresden museum. The drawings for this masterpiece are among the most precious relics in the museum of Basel. The time now came when art began to suffer from an unavoidable depression in all countries north of the Alps. Holbein, at Basel, was reduced to accept the smallest commissions—even for scutcheons. Then he saw that his chances were dwindling to nothing, and taking a bold resolution, armed with letters of introduction from Erasmus to More, he crossed the Channel to England, where in the one-sided branch of portrait painting he found an endless circle of clients. Eighty-seven drawings by Holbein in Windsor Castle, containing an equal number of portraits, of persons chiefly of high quality, testify to his industry in the years which divide 1528 from 1543. They are all originals of pictures that are still extant, or sketches for pictures that were lost or never carried out. Sir Thomas More, with whom he seems to have had a very friendly connection, sat to him for likenesses of various kinds. One drawing belonged, and perhaps still belongs, to Mr. Huth in London. A pen-and-ink sketch, in which we see More surrounded by all the members of his family, is now in the gallery of Basel, and numerous copies of a picture from it prove how popular the lost original must once have been. At the same period were executed the portraits of Warham (Lambeth and Louvre), Wyatt (Louvre), Sir Henry Guildford and his wife (Windsor and Mr. Frewen), all finished in 1527, the astronomer Kratzer (Louvre), Godsalve (Dresden), and Bryan Tuke (Munich) in 1528. In this year, 1528, Holbein returned to Basel, taking to Erasmus the sketch of More's family. With money which he brought from London he purchased a house at Basel wherein to lodge his wife and children, whose portraits he now painted with all the care of a husband and father (1528). He then witnessed the flight of Erasmus and the fury of the iconoclasts, who destroyed in one day almost all the religious pictures at Basel. With the exception of a portrait of Melancthon (Hanover) which he now completed, Holbein found little to do at Basel. The year 1530, therefore, saw him again on the move, and he landed in England for the second time with the prospect of bettering his fortunes. Here indeed political changes had robbed him of his earlier patrons. The circle of More and Warham was gone. But that of the merchants of the Steelyard took its place, for whom Holbein executed the long and important series of portraits that lie scattered throughout the galleries and collections of England and the Continent, and bear date after 1532. Then came again the chance of practice in more fashionable circles. Henry VIII. invited him to make a family picture of himself, his father and family, which obtained a post of honor at Whitehall. Holbein in 1538 took the opportunity of revisiting Basel, where he made his appearance in silk and satin, and *pro forma* only accepted the office of town painter. His return to London in autumn enabled him to do homage to the king in the way familiar to artists. He presented to Henry at Christmas a portrait of Prince Edward. Again abroad in the summer of 1539, he painted with great fidelity the Princess Anne of Cleves, at Duren near Cologne, whose form we still see depicted in the great picture of the Louvre. That he could render the features of his sitter without flattery is plain from this one example.

Among the more important creations of Holbein's later time we should note his Duke of Norfolk at Windsor, the hands of which are so perfectly preserved as to compensate for the shrivel that now disfigures the head. Two other portraits of 1541 (Berlin and Vienna), the Falconer at the Hague, and John Chambers at Vienna (1542), are noble specimens of portrait art;

most interesting and of the same year are the likenesses of Holbein himself, of which several examples are extant—one particularly good at Fährna, the seat of the Stackelberg family near Riga, and another at the Uffizi in Florence. Here Holbein appears to us as a man of regular features, with hair just turning gray, but healthy in color and shape, and evidently well-to-do in the world. Yet a few months only separated him then from his death-bed. He was busy painting a picture of Henry VIII. confirming the Privileges of the Barber Surgeons (Lincoln's Inn Fields), when he sickened of the plague and died, after making a will, about November, 1543.

HOLBERG, LUDVIG HOLBERG, BARON, the greatest of Scandinavian writers, was born at Bergen, in Norway, December 3, 1684, and died in 1754.

Holberg was not only the founder of Danish literature and the greatest of Danish authors, but he was, with the exception of Voltaire, the first writer in Europe during his own generation. Neither Pope nor Swift, who perhaps excelled him in particular branches of literary production, approached him in range of genius, or in encyclopædic versatility. Holberg found Denmark provided with no books, and he wrote a library for her. When he arrived in the country, the Danish language was never heard in a gentleman's house. Polite Danes were wont to say that a man wrote Latin to his friends, talked French to the ladies, called his dogs in German, and only used Danish to swear at his servants. The single genius of Holberg revolutionized this system. He wrote poems of all kinds in a language hitherto employed only for ballads and hymns; he instituted a theater, and composed a rich collection of comedies for it; he filled the shelves of the citizens with works in their own tongue on history, law, politics, science, philology, and philosophy, all written in a true and manly style, and representing the extreme attainment of European culture at the moment. Perhaps no author who ever lived has had so vast an influence over his countrymen, an influence that is still at work after nearly 200 years.

HOLCROFT, THOMAS, dramatist and miscellaneous writer, was born December 10, 1745 (old style), in Orange Court, Leicester Fields, London. He died March 23, 1809, from enlargement of the heart, brought on, it is supposed, by the failure of several of his dramatic pieces.

HÖLDERLIN, JOHANN CHRISTIAN FRIEDRICH (1770-1843), German poet, was born March 29, 1770, at Lauffen on the Neckar. He died June 7, 1843.

Hölderlin's writings are the production of a beautiful and sensitive mind, a mind of high ideas and noble impulses; but they are intensely, almost morbidly, subjective, and they lack real human strength. Perhaps his strongest characteristic was his passion for Greek subjects, and the natural result of this was that he almost entirely discarded rhyme in favor of the ancient verse measures. His poems are all short pieces; of his tragedy only a fragment was written. *Hyperion, oder der Eremit in Griechenland*, is thus his one important work; and even to this a sequel is wanting. It may be called a prose poem, and is written in the form of letters. Its exquisite language, the purity of its tone, the sad philosophical vein which permeates it, together with its autobiographic character, claim for it a unique position among German classics.

HOLESCHAU, HOLLESCHAU, or HOLESOV, chief town of a government district in Moravia, Austria, circle of Hradisch, is situated on the Russawa, twenty miles north-northeast of Hradisch.

HOLIBUT, or HALIBUT (*Hippoglossus vulgaris*), is the largest of all Flat-fishes, specimens of five feet in

length and of 100 lb. in weight being frequently exposed for sale in the markets. Indeed, specimens under two feet in length are very rarely caught, and singularly enough, no instance is known of a very young specimen having been obtained. The holbut is much more frequent in the higher latitudes of the temperate zone than in its southern portion; it is a circumpolar species, being found on the northern coasts of America, Europe, and Asia, extending in the Pacific southward to California.

HOLINSHED, or **HOLLINSHED**, **RAPHAEL**, author of *Chronicles of England, Scotland, and Ireland*, flourished in the sixteenth century. He belonged to a family settled at Bosley, in Cheshire, and according to Anthony Wood he was educated at one of the universities and took orders in the church. In the compilation of the *Chronicles* called by his name he bore a leading part, but he received extensive and important aid from Stow the antiquary, Harrison, chaplain to Lord Cobham, Hooker (*alias* Vowell), an uncle of the divine of that name, and Francis Boteville (*alias* Thin), a learned antiquary.

HOLKAR, the title of the mahārājā of **INDORE**, (*q. v.*) whose territories are often designated Holkar's Dominions.

HOLLAND is the most usual English name of the country which is nationally designated the Kingdom of the Netherlands (*Koninkrijk der Nederlanden*). The word, which is popularly explained as if it were *Hollowland*, and referred to the same physical fact which has given rise to the terms *Netherlands* and the *Low Countries*, appears in an older form as *Holland*, and is thus evidently equivalent to *Wood-land*. In French the usual expression is *Pays-Bas*, and in German *Niederlande*. Pop. (1901), 5,179,100; area, 12,648 sq. m.

There is no country in Europe in which the character of the territory has exercised so great an influence on the inhabitants as in the Netherlands; and, on the other hand, no people has so extensively modified the condition of its territory as the Dutch. In a description of *Holland*, consequently, the greatest importance must be attached to the physical conformation of the country as it was and is; and most of the peculiarities of the political and social condition of the people must be considered in connection with this conformation.

The size of *Holland*, being subject to perpetual diminution and increase, cannot be indicated by a definite figure except as at some definite period; on the one hand, there is loss of area still going on in consequence of the erosion of the coasts, and, on the other hand, this is more than counterbalanced by a continual acquisition of new ground due more especially to "impoldering" and draining operations.

The Kingdom extends from 53° 32' 21" (Groningen Cape on Rottum Island) to 50° 45' 49" N. latitude (Mesch in the province of Limburg), and from 3° 23' 27" (Sluis in the province of Zeeland) to 7° 12' 20" E. longitude (Langakkerschans in the province of Groningen). The greatest length from north to south, viz., that from Rottum Island to Eysden near Maestricht, is estimated at 164 miles, and the greatest breadth from southwest to northeast, or from Zwin near Sluis to Losser in Overijssel, at 144 miles. If the Zuyder Zee, the parts of Prussia which encroach on the eastern side, and the projecting portions of Limburg and Zeeland are disregarded, the general form is almost an oblong. With the exception of Greece and Great Britain, no country of Europe has so many inlets of the sea as *Holland*.

The Netherlands are bounded on the east by the Prussian provinces of Hanover, Westphalia, and the province of the Rhine, and on the south by the Belgian

provinces of Liège, Limburg, Antwerp, and East and West Flanders. A purely geographical boundary is formed to the west and the north by the North Sea, at the northeast corner by the Dollart, and from Stevensweert southward to the extreme corner of Limburg (near Eysden) by the Maas or Meuse. Natural ethnographic frontiers, such as occur where two neighboring peoples of different origin, race, character, customs, and language are sharply marked off from each other, do not exist in the case of the Netherlands. The Low German element, indeed, of which the Netherlands form as it were the kernel, spreads beyond Dutch limits both northeast along the coast of the German Ocean and southwest into Belgium.

Sea-dykes are found along the northern coasts, the coasts of the provinces which border on the Zuyder Zee, and the coasts of the islands of Zeeland and South Holland so far as they are not protected by dunes. Only in a few places, it will be seen, are the sea-dykes unnecessary; as, for example, in Friesland between Stavoren and Olde Mirdum (the bold and steep Roode and Mirdum cliffs) and near Doornspijk, three miles south of Elburg, where there are high grounds which stretch six miles to the southwest of Harderwijk. The earthen dykes are protected by stone-slopes and by piles, and at the more dangerous points also by "zinkstukken" (sinking pieces), artificial structures of bulrushes, reeds, and branches laden with stones, and measuring some 400 yards in circuit, by means of which the current is to some extent turned aside. The Westkappel dyke is 12,468 feet long and 23 high, has a seaward slope of 300 feet, and is protected by rows of piles and basalt rocks. On its ridge, thirty-nine feet broad, there is not only a roadway but a service railway. When it is remembered that the woodwork is infested by the pile-worm (*Teredo navalis*), the ravages of which were discovered in 1731, the enormous expense incurred in the construction and maintenance of the 1,550 miles of sea-dykes now existing may be imagined. The cost of construction is not over-estimated at 150,000,000 guilders, or £12,500,000.

The Dutch islands may be divided into two main classes—(1) those surrounded on all sides by the German Ocean or its inlets, and (2) those surrounded entirely or in great part by river arms, and separated by these from the mainland or from each other. The first division again comprises two groups—(a) the islands Texel, Vlieland, Terschelling, Ameland, Schiermonnikoog, and Rottum, which stretch in a long arc from the north point of North Holland to the mouth of the Ems, and indicate the old coast-line, so that they belong to the same physico-geographical group with the islands along the German coast; and (b) the islands Wieringen, Marken, Urk, and Schokland, which are the relics of the stretch of country formerly comprising the present bed of the Zuyder Zee. In the second class are to be reckoned the delta of the river Yssel (Camper Island) and the islands belonging to the contiguous deltas of the Rhine, the Meuse, and the Scheldt, including the island of Betuwe between the Rhine and the Waal and the archipelago of South Holland and Zeeland.

The varying characteristics of the coasts in different places give rise to correspondingly different industries. As regards trade and navigation, the west coasts with their shallows and sandbanks can be approached only by small vessels of light draught (*visscherspinken*) unless where access is afforded by the inlets of the sea, especially the mouth of the West Scheldt at Flushing, that of the East Scheldt at Zierikzee, the Brouwershaven inlet between the islands of Schouwen and Goeree, the Goeree inlet at Helvoetsluis, the Marsdiep at the Helder, and the mouth of the Ems at Delfzijl, or where a way

has been opened up by engineering works as at Rotterdam and Amsterdam (by the new waterway to the sea and the canal to Ymuiden). As we proceed from southwest to northeast the places along the coast become less and less important; in the provinces of Groningen and Friesland the approach to the mainland is obstructed by the Wadden or Shallows; and on the coast of the Zuyder Zee are those harbors, for the most part rendered useless by alluvial accretions, which have been so well described by Harvard in his *Villes Mortes du Zuyderzee*. Along the greater part of these coasts the population is engaged in the fisheries rather than in trade, especially when the neighborhood of a great town (as Alkmaar for Egmond, Haarlem for Zandvoort, Leyden for Katwijk, the Hague for Scheveningen) secures a good market or a ready means of exportation. Many fishing villages on the west coast, *e. g.*, Scheveningen, Domburg, and Zandvoort, have in recent years acquired repute as watering places with both natives and foreigners.

The climate of Holland is such as might be conjectured from its geographical position and its generally low level. Situated in the temperate zone between 50° and 53° N. latitude, it shows a difference in the lengths of day and night extending in the north to nine hours, and there is a correspondingly wide range of temperature; it also belongs to the region of variable winds.

It cannot be said that the climate is particularly good; indeed to strangers it is rather the reverse of pleasant. Fews, colds, and, when proper precautions are not taken, chest disease and consumption, are results of the changeableness of the weather, which may alter completely within a single day. The heavy atmosphere likewise, and the necessity of living within doors or confined localities, cannot but exercise an influence on the character and temperament of the inhabitants. Only of certain districts, however, can it be said that they are positively unhealthy; to this category belong some parts of Holland, Zealand, and Friesland, where the inhabitants are exposed to the exhalations from the marshy ground, and the atmosphere is burdened with the sea-fogs.

The density of the population must, apart from other causes, increase through the acquisition and cultivation of new land, and it visibly differs very greatly according to the difference of the soil in the different provinces.

The greater density of population in the Holland provinces as compared with the Drenthe cannot be explained, however, merely by the character of the soil; the variety of industries and the great number of large towns contribute to the inequality. All the towns with 100,000 inhabitants and upward (Amsterdam, Rotterdam, and the Hague) are situated in the provinces of Holland; of the thirty-six communes with more than 10,000, nine are in Holland, none in Drenthe; of the thirty-five communes between 10,000 and 4,000, nine are in Holland and two in Drenthe.

As the density of the population varies within the narrow limits of the Netherlands, so varies likewise the origin of the people. Although ethnographically the whole population belongs to the Indo-Germanic family, or more definitely to the Teutonic branch of it, the descendants of the Frisians may be clearly distinguished in the northwest. The mouths of the Meuse separate these from the descendants of the Franks, who pushed eastward across the Meuse but never settled beyond the Waal, while the territory of the Saxons, who came later from the east, extends no further than to the Utrecht Vecht. The descendants of the Saxon consequently lie between those of the two first-named peoples, although naturally much commingling has taken place between Frisians and Saxons, and Saxons

and Franks, especially in the towns and on the newly-acquired lands. The representatives of the Semitic stock (Portuguese or German Jews), though their influence is not unimportant, number only 50,000 or 60,000, of whom about 40,000 reside at Amsterdam. The descendants of the three Teutonic peoples above named are very slightly distinguished from each other by their physical, intellectual, and moral characteristics, and all the less so because the Dutch type is not itself strongly marked and bears the traces of foreign commixture; for many Flemings and Brabanters settled in the country at the time of the revolt against Spain, many Germans, Englishmen, and Scandinavians during the prosperity of the republic, and many Frenchmen after the revocation of the edict of Nantes. The differences most clearly discernible are in the old local laws, in the peculiar customs, and above all in the dialects. Among these last must be distinguished the Holland dialect (Hollandsch), spoken in the provinces of Holland and part of Utrecht; the Zealand dialect (Zeeuwsch, in Staats Flanders inclining toward Flemish); the Brabantine (modified), also spoken in a part of Limburg and the south of Guelderland; the Lower Rhenish, which is again subdivided into the Guelderland, the Overijssel, and the Drenthe dialects; and, finally, the Groningen dialect. The peasant or country Frisian forms a completely separate language with a literature of its own.

The government of the Netherlands is regulated by the constitution of 1815, revised in 1848, under which the king's person is inviolable and the ministers are responsible. The crown is hereditary in both the male and the female line according to primogeniture; but it is only on the complete extinction of the male line that females can come to the throne. The crown prince or heir-apparent is the first subject of the king, and bears the title of the Prince of Orange. The king alone has executive authority. To him belong the ultimate direction of foreign affairs, the power to declare war and peace and to make treaties and alliances, the supreme command of the army and navy, the supreme administration of the finances, and of the colonies and other possessions of the kingdom, and the prerogative of mercy. By the provisions of the same constitution he establishes the ministerial departments, and shares the legislative power with the first and second chambers. The heads of the departments to whom the especial executive functions are intrusted are eight in number—ministers respectively of the interior, of public works, of justice, of finance, of war, of marine, of the colonies, and of foreign affairs. They are appointed and dismissed at the pleasure of the king, usually determined, however, as in all constitutional states, by the will of the nation as indicated by its representatives. The members of the first chamber are chosen by the provincial states from among those who bear the greatest burden of direct taxation in each province, the proportion of persons thus eligible being one to every 3,000 of the population. The duration of parliament is nine years, one-third of the members retiring every three years. The retiring members are eligible for reelection. The members of the second chamber are chosen in the electoral districts by all citizens of full age who pay direct taxes varying according to local circumstances from 20 to 160 guilders. One member is elected for every 45,000 of the population; they must be at least thirty years old, and they cease to be members if they take a salaried government appointment. They discuss all laws, and have the right of proposing amendments. Their term is four years, but they are reëligible. All communications from the king to the states-general, and from the states to the king, as well as all general measures relating to internal

administration or to foreign possessions, are first submitted to the consideration of the council of state, which also has the right of making suggestions to the king in regard to subjects of legislation and administration. The king appoints the vice-president of the council, which consists of fourteen members; he is himself the president, and can name councilors, to the number of not more than fifteen, for special service.

The provisional administration is intrusted to the provincial states, which are returned by direct election by the same electors as voted for the second chamber. The term is for six years, but part of the members retire every three years. The president of the assembly is the royal commissioner for the province. As the provincial states only meet a few times in the year, they name a committee of deputy-states to which the management of current general business is intrusted, and which at the same time administers the affairs of the communes. At the head of every commune stands a communal council, whose members are chosen by the inhabitants for a definite number of years. The president of the communal council, the burgomaster, is named by the king in every instance for six years, and along with the magistrate to be chosen by and from the members of the council is charged with the ordinary administration. The provinces, as already stated, are eleven in number (the grand-duchy of Luxembourg, over which the king has control, is not incorporated with the kingdom).

The administration of justice is intrusted (1) to the high council, the supreme court of the whole kingdom, which holds its sessions at the Hague, and is the tribunal for all high government officials and for the members of the states-general; (2) to the five courts of justice for criminal cases, and for appeal in more important police and civil cases; (3) to courts established in each arrondissement; (4) to cantonal judges appointed over a group of communes, whose jurisdiction is restricted to claims of small amount (under 200 guilders), and to breaches of police regulations, and who at the same time look after the interests of minors.

The standing army consists of infantry, cavalry, artillery, engineers and gendarmerie, forming together a force of 25,762 men, and 1,911 officers. Less than half, however, is kept in arms the whole year. The soldiers are raised partly by voluntary enlistment and partly by conscription. The soldiers are selected from the males who have entered their twentieth year and are not exempted for special reasons. The term of service in time of peace is five years, but may be extended in time of war; the conscript recruits, however, so far as the number of volunteers permits, are kept under arms for a few months only. A portion of the annual contingent is appropriated to the marine service. In the communes there are "schutterijen," militia "trainbands," which in time of war serve for the defense of the country, and at all times for the maintenance of order. Their actual term of service lasts only five years, but every male inhabitant from his twenty-fifth to his thirty-fourth year is liable to be called out.

The strength of the navy in 1899 was 129 men-of-war, of which thirty-two were iron-clads.

The inhabitants of Holland enjoy full religious as well as political liberty. Not only is the free profession of his religious opinions guaranteed to everyone by the constitution; the same protection is accorded to all the various ecclesiastical bodies, all the adherents of the different creeds have equal civil and political rights, and equal claims to public offices, dignities and appointments; and all denominations possess perfect freedom of administration in everything relating to their religion and its exercise. The various denominations are subsidized by the state.

Primary education is being more widely diffused year after year, and at the same time receiving increased support from the state. There are no bilingual schools in Holland, and teachers discourage the use of the dialects. For secondary education there are "burgher schools" (partly day schools, partly night schools). The higher education is provided for in the four universities of Leyden (founded in 1575), Utrecht (1636), Groningen (1614), and Amsterdam (1877). A national institution at Leyden for the study of the languages, geography and ethnology of the Dutch Indies has given place to communal institutions of the same nature at Delft and at Leyden, founded in 1864 and 1877. Military and naval instruction are provided for by corps schools, by a training battalion at Kampen, an artillery training company at Schoonhoven, and scientific courses for the several corps by the royal military academy (founded 1828), the "school of war" for officers, the royal navy institute at Willemsoord (1856), and by training ships at Amsterdam, Rotterdam, and Helvoetsluis for apprentice boat-swains, sailors, cabin-boys, pilots and engineers. For the education of medical practitioners, civil and military, the more important institutions are the national obstetrical college at Amsterdam, the national veterinary school at Utrecht, the national college for military physicians at Amsterdam, and the establishment at Utrecht for the training of military apothecaries for the East and West Indies.

Of the numerous institutions in Holland for the encouragement of the sciences and the fine arts, the following are strictly national: The royal academy of sciences (1855), the royal Netherlands meteorological institute (1854), the national academy of the plastic arts, the royal school of music, the national archives, the royal picture gallery at the Hague, and the national gallery of modern masters in the Pavilion at Haarlem, the national museum of antiquities, the national museum of ethnography at Leyden, the royal collection of curiosities at the Hague, etc. Provincial scientific societies exist at Middelburg, Utrecht, Bois le Duc, and Leeuwarden, and there are private and municipal associations, institutions, and collections in a large number of the smaller towns. Among others of general utility are the society for the service of the community (*Maatschappij tot nut van't algemeen*, 1784), and the geographical society at Amsterdam (1873), Teyler's Stichting or foundation, and the society of industry at Haarlem, the royal institute of languages, geography, and ethnology of the Dutch Indies (1851) and the Indian society at the Hague, the royal institute of engineers at Delft (1848), the association for the encouragement of music at Amsterdam, etc.

The agricultural methods vary according as the soils are sandy or clay. In the first the "three-crop" system (two crops of rye and one of buckwheat) differs widely from the careful Flemish method of cultivation, in which even the pastures are manured. On the clay there is still greater variety both in the modes of treatment and in the amount of care bestowed on weeding and draining. The produce of the land is thus very different in the various provinces for the same soil. The general value of the crops is gradually rising. Improved education and the influence of local associations for the advancement of the interests of agriculture have contributed to the result. The woods, or rather the plantations, covering 6 per cent. of the acreage, consist of—(1) the so-called forest timber (*opgaandhout*; French, *arbres de haute futaie*),—including the beech, oak, elm, poplar, birch, ash, willow, and coniferous trees; and (2) the copse wood (*akkermaal* or *hakhout*),—embracing the alder, willow, beech, oak, etc. This forms no unimportant branch of the national wealth.

Stock-breeding varies in the different provinces. For cattle, Friesland and North and South Holland take the lead as regards both quality and numbers; sheep are best in Texel and North Holland, and most numerous in Drenthe, where their preponderance is due to the number of commons which still remain unbroken up. Pigs, for which the lowlands are peculiarly favorable, are reared in all the provinces. Goats, mainly kept for their milk, are most numerous in Guelderland and North Brabant. Guelderland, Friesland, Zealand, and Groningen possess the greatest number of horses. Poultry, especially fowls, are generally kept. Bee culture is mainly carried on in buckwheat and heath districts (Guelderland, Overijssel, Drenthe, the Gooiland, and Utrecht). A bee market is held at Veenendaal in Utrecht. Stock-breeding is mainly carried on along with dairy-farming and haymaking on the alluvial soils; and there the cereal crops give way to fodder plants. The permanent pasture in recent years extends to some 2,500,000 of acres, and clover, artificial meadows, etc., occupy about 400,000. The production of milk, butter, and cheese amounts to the value of 90,000,000 of guilders (40 cents each); butcher meat produces 35,000,000, and wool, hides, fowls, and game 10,000,000; while horse-breeding also yields a total of 10,000,000.

In the densely peopled Netherlands, with no extensive forests, hunting forms rather an amusement than a means of subsistence, the only exception being the pursuit of wild-fowl (ducks, geese and snipes). Hares, partridges, wood-snipes, finches, and thrushes are the only form of game; a few roebucks and deer are found in Overijssel and Guelderland; rabbits are numerous in the dunes, and seagulls' eggs are gathered in the north of Texel, which consequently bears the name of *Eijerland* (*i.e.*, Egeland).

Much more important as a means of subsistence are the fisheries. They are divided into the "deep-sea fishery" (*buitengaatsch*) in the German Ocean, and the "inner" fisheries (*binnengaatsch*) in the Zuyder Zee, the rivers of Zealand, and the inland waters. The deep-sea fishery may be further divided into the great (the so-called "salt-herring") fishery, mainly carried on from Vlaardingen and Maassluis, and the "fresh-herring" fishery, chiefly pursued at Scheveningen, Katwijk, and Noordwijk. The deep-sea fisheries also yield cod and flat fish. In the Zuyder Zee flat fish, herrings, anchovies, and shrimps are caught off the islands of Urk and Marken and the coast towns of Vollenhove, Kampen, Harderwijk, Huizen, and Vollandam; and there are oyster banks near Texel. In the Zealand rivers oysters and mussels are obtained at Bruinisse, Philippine, and Graauw, and anchovies at Bergen-op-Zoom; while salmon, perch, and pike are caught in the Meuse, the Lek, and the Merwede, and eels in the Frisian lakes. The fisheries not only supply the great local demand, but allow large exports.

To obtain a correct idea of the trade of the Netherlands greater attention than would be requisite in the case of other countries must be paid to the inland traffic. It is impossible to state the value of this in definite figures, but an estimate may be formed of its extent from the number of ships which it employs in the rivers and canals, and from the quantity of produce brought to the public markets or daily transported by thousands of carts and delivered by the peasant direct to the salesman. Of the market traffic, even in places of secondary rank, the following facts may give some idea. There are yearly brought to market at Gorcum and Hoorn from 10,000 to 13,000 head of cattle; at Barneveld, more than 20,000 sheep; at Alkmaar about 10,000,000 and at Hoorn 5,500,000 pounds of cheese; at Delft 1,500,000 pounds of butter and 2,000,000 pounds

of cheese; at Meppel 3,000,000 pounds of butter; at Leeuwarden 9,000,000 to 11,000,000 pounds of butter, 2,000,000 pounds of cheese, and 7,500,000 pounds of grain and seeds; at the Overijssel markets Zwolle, Deventer, and Kampen, and at Steenwijk and Almelo, 7,500,000 pounds of butter; at Utrecht 770,000 and at Groningen 330,000 bushels of grain and seeds.

The foreign trade, although less than it was formerly, still continues to be considerable in proportion to the size of the country.

The six ports which take the largest share in the foreign trade are Amsterdam, Rotterdam, Helder, Dort, Schiedam, and Harlingen; at a considerable distance follow Groningen, Middelburg, Vlaardingen, Purmerend, Zaandam, Edam, Zwolle, Kampen, and Delfzijl. The returns of recent years show best in the case of the South Holland towns; but it must be kept in view that the direct imports, the so-called "proper trade," are most important at Amsterdam, while a great part of the commercial business at Rotterdam belongs to the commission and transit trade. For exports Rotterdam is by far the most important, sending out nearly thrice as much as Amsterdam.

An examination of its lists of exports and imports will show that Holland receives from its colonies its spices, coffee, sugar, tobacco, indigo, cinnamon; from England, Prussia, and Belgium its manufactured goods and coals; grain from the Baltic provinces, Archangel, and the ports of the Black Sea; peas and beans from Prussia, timber from Norway and the basin of the Rhine, yarn from England, wine from France, hops from Bavaria and Alsace; while in its turn it sends its colonial wares to Germany, its agricultural produce to the London market, its fish to Belgium and Germany, and its cheese to France, Belgium, and Hamburg, as well as England. The briskest trade is carried on with Germany and England; then follow Java, France, Russia, the United States, etc.

The mineral resources of Holland give no encouragement to industrial activity, with the exception of the coal mining in Limburg, the smelting of iron ore in four furnaces in Overijssel and Guelderland, the use of stone and gravel in the making of dykes and roads and of clay in brickworks and potteries, the quarrying of stone at St. Pietersberg, etc. Still the industry of the country has developed itself in a remarkable manner since the separation of Belgium, and that in spite of the lack of iron and coal, and the rivalry of other productive forms of labor. The greatest activity is shown in the cotton industry, which especially flourishes in Twente (in Overijssel) and also at Haarlem and Veenendaal. In the manufacture of woolen goods Tilburg ranks first, followed by Leyden, Utrecht, and Eindhoven; that of half woollens is best developed at Roermond and Helmond. The cotton and woolen manufactures together furnish employment to 20,000 hands. The linen manufacture is carried on especially in Meierij van den Bosch, Helmond, Bostel, Woensel, etc. Even ironworks and machine factories have greatly increased since the free importation of the raw material was permitted—for example, at Amsterdam and at Fijenoord opposite Rotterdam; and in this department more than 6,000 workers are employed throughout the country. It need hardly be said that shipbuilding is of no small importance in the Netherlands, not only in the greater but also in the smaller towns along the rivers and canals; and it is naturally associated with rope-spinning and other auxiliary crafts. Among other noteworthy branches of industry are the making of cigars and snuff, especially at Eindhoven, Amsterdam, Utrecht, and Kampen; diamond cutting at Amsterdam; beet-root sugar refining at Amsterdam; paper-making in the

Veluwe, on the Zaan, and in Limburg; shoemaking and leather-tanning in Brabant (Langstraat); mat-plaiting and broom-making at Genemuiden and Blokzijl; the manufacture of glass, crystal, and earthenware at Maastricht; carpet-weaving at Deventer; working in gold and silver in North and South Holland and on a smaller scale at Schoonhoven; and the distillation of brandy, gin, and liqueurs at Schiedam, Rotterdam, and Amsterdam. The number of hands occupied in the manufactories throughout the whole of the Netherlands is estimated at about 100,000, of whom three-fourths are settled in North and South Holland, North Brabant, and Overijssel.

As the development of trade and industry and agriculture was promoted by the improvement of education and the abolition of transit and export dues, and the lessening of import dues, so also has it been advanced by the improvement of the means of communication, and of the postal and telegraph systems. The waterways of the country are perhaps more extensive in proportion to area than in any other country in the world. The roads are divided into national or royal roads, placed directly under the control of the "waterstaat" and supported by the state; provincial roads, under the direct control of the states of the provinces, and almost all supported by the provincial treasuries; communal and polder roads, maintained by the communal authorities and the polder boards; and finally, private roads. The system of national roads, mainly constructed between 1821 and 1827, but still in process of extension, brings into connection nearly all the towns. The construction of railways was long deferred and slowly accomplished: the "Holland Railway" was laid down in 1839-47, the Rhine Railway in 1843-56, the Aix-Maastricht-Landen line in 1853-56, and the Dutch-Belgian in 1853-54. All the other lines, *e.g.*, that from Maastricht to Liège, the Central Railway, the Nimeguen line, the Almelo-Salzburg line, the State Railway system, etc., have been constructed since 1861, a large number of them having been opened about 1863 and 1864. A great improvement has in consequence been effected in the communication.

The Dutch colonies, originally mere trading communities, have so much increased in importance, through the cultivation of their various vegetable products, the reclaiming of their waste lands, and the working of their mines, that they cannot be left altogether out of view in considering the trade and finances of the mother country. The Dutch colonies in the East Indies, situated between 30° N. latitude, and 6° S. latitude, and between 95° and 141° E. longitude, comprise an area of 736,400 square miles, with a population of about 34,000,000, among which are 62,000 Europeans, 460,000 Chinese, 24,000 Arabs, and 27,000 other immigrant Asiatics. For convenience of supervision they are divided into the great Sunda (Soenda) Islands, the Smaller Sunda Islands, and the Moluccas—a division which is based neither on political nor on ethnological considerations, nor on the phenomena of animal or vegetable distribution. The Great Sunda Islands are Java, Sumatra, Celebes, and Borneo, all with subsidiary islands; the Smaller Sunda Islands comprise Bali, Lombok, Soembawa, Flores, Sandalwood Island and Timor; the Moluccas include Halmahera, Ceram, Buru (Bocroe), Amboyna, Banda and the southeastern groups, besides Western New Guinea. The West Indian possessions of Holland include Dutch Guiana or the government of Surinam, and the Dutch Antilles or the government of Curaçoa and its dependencies (St. Eustatius, Saba, the southern half of St. Martin, Curaçoa, Bonaire, and Aruba), a total area of

60,000 square miles, with 90,000 inhabitants, of whom a small portion are Europeans, and the rest negroes and other people of color, Chinese, and other emigrants. The East Indian possessions yield an annual average contribution, as already stated, of over £800,000; the West Indian, on the other hand, require aid to the amount of £500,000 or £600,000 yearly.

The character of the Dutch may be largely explained by their history, the conformation of the country, their means of subsistence, their strife with the sea, and their struggles to maintain their independence against Spain and against hostile neighbors. The love of freedom and independence is the leading element in their character; the peculiarity of their soil has constrained them to be industrious and economical; their contest against the sea, their wars, and their distant expeditions have trained them to bravery and self-possession; and their liberality has been stimulated by the disasters which, falling upon one-to-day, might be the lot of any other to-morrow. Of course the virtues of the Dutch are apt to be distorted to vices; their composure not seldom becomes indifference; their tendency to reflection makes them laggard in action and deficient in enterprise; their love of liberty degenerates into an extravagant sense of independence that is more concerned about rights than about duties. Sociability is by no means a dominant characteristic of the Dutch; they speak little and laugh less. But their appearance and expression give a poor indication of their sterling qualities. Their general sincerity and uprightness are evident to every one whose own respectability gains him admission, on terms of familiar intercourse, to the respectable circles of Dutch society.

History.—The oldest inhabitants of Holland of whom anything is known were of Celtic origin; so much may be gathered from scanty remains found in cairns, from a few proper names, such as Nimeguen (Nimwegen) and Walcheren, and from the Druid altars found in that island. In Cæsar's day the whole district between the Rhine and the Scheldt was occupied by Belgæ, the bravest of Celts, while the Betaw, the "good meadow," the Insula Batavorum, was peopled by a portion of the Germanic tribe of the Chatti, and provided first the stoutest foes and then the most serviceable allies of the Roman empire. But if the Batavi were the most distinguished of the Germanic tribes in the country, the "free Frisians" (see FRISIANS), who filled the whole northern portion of it, were by far the most important; in addition to them, and mostly on the borderland, were others, Usipetes, Bructeri, Sicambri, Chamavi, Eburones, and the like, of whom we know little but the names.

The first Christian church in the Netherlands was founded in the time of Dagobert I., who had reduced the Frisians and Saxons at the town of Wiltenberg, afterward Utrecht, between 622 and 632. But the true apostle of the Netherlands was Willibrord the Northumbrian, first bishop of that see (695). He made Utrecht the center from which Christian light spread across a wide circle of heathendom; and under the protection of Pippin of Herstal, the new faith was so firmly planted in those parts, that when Willibrord died Limburg, North Brabant, Utrecht, and other districts had accepted the faith of the Franks. After Willibrord, Christianity had in that part of Europe another stout champion, Wolfram of Sens, who had nearly persuaded the Frisian king, Radbod, to be a Christian; and lastly in 755, St. Boniface, "the apostle of the Germans," was martyred at Dokkum in Friesland while preaching among the heathen. Toward the end of the century the stern methods of Charles the Great completed the conversion of the Netherlands.

During the early period of Dutch history the country passed successively under Roman rule; then under the dominion of the Frankish empire, with an ever-changing lordship, as that empire was torn asunder by internal factions, during which period it suffered from incursions by the Norsemen, till in the eleventh century the nucleus of the present Holland was formed under the rule of the counts of Holland, which dynasty lasted for nearly four hundred years. This line of rulers began with Count Dirk and ended with John I., who died in 1300. At this point Holland (which had continued its connection with the German empire, and suffered correspondingly in the fluctuations of politics which that government underwent) became independent.

The fragments of Nether Lorraine, Holland, Guelderland, Utrecht, Brabant, and Flanders paid little heed to their nominal lord; Holland especially, so far from the center of the empire, so nearly forgotten in the greater troubles of Italy or Switzerland, was left to herself. She made her own laws, imposed river-dues (a recognized imperial right), named her own officers, held high court of justice, coined money, made peace or war at will. Even the *de jure* authority of the empire over Holland is a matter of doubt, much debated by publicists and historians.

When John of Avenne succeeded in 1299 as first count of the house of Hainault, the Hollanders were willing to receive him, the Zealanders not; and a long struggle between the provinces ensued. In 1301 he coerced Utrecht into alliance, and got the bishopric for his brother Guy. In 1304 the Flemings were driven out of Holland, and John II. was for a few months real lord of the country. He died that year, and was succeeded by his son William III. "the Good" (1304-1337), who made peace with Flanders in 1323, settled the outstanding quarrel between Holland and Zealand, united the Amstelland and its city Amsterdam to his territories, encouraged civic life, and developed the resources of his country. He also entered into close relations with the states of Europe, having married Johanna of Valois, niece of the French king; in 1323 the emperor Louis the Bavarian wedded his daughter Margaret, and in 1328 his third daughter, Philippa of Hainault, was given to Edward III. of England. William III. was in all respects a great prince, and an acute statesman. In 1337 he died, and was succeeded by his son William IV., who was killed fighting against the Frisians in 1345. He left no children, and the question as to the succession now brought on Holland a time of violent civil commotions. The country was claimed by Margaret, William's eldest sister, as well as by Philippa of Hainault, or, in other words, by Edward III. of England. Margaret eventually succeeded, siding with the older nobles, and being, therefore, not well received by the towns. These are the days in which came up the famous parties of "Kabbeljaus" and "Hoeks," the "Cods" and the "Hooks," the fat burgher fish and the sharp steel-pointed nobles who wanted to catch and devour them. After much buffeting and many changes of fortune, Margaret resigned her lordship in 1349 in favor of her second son William, but again resumed it in 1350. Then the struggle between nobles and cities broke into open war. Edward III. came to Margaret's aid, winning a sea fight off Veere in 1351; a few weeks later the Hooks and the English were defeated by William and the Cods at Vlaardingen — an overthrow which ruined Margaret's cause. She made peace with her son in 1354, and died two years later. He, however, shortly after fell mad; so that in 1358 the Hooks had to call in his younger brother, Albert of Bavaria, to be stadtholder or "ruwaard" in his stead; he ruled well, and restored some order to the land. In the latter part of his life he went

over to the Cods, a step which led to another outbreak of civil war which lasted until 1395. In 1404 he died, and was succeeded by his son William VI., who upheld the Hooks with all his power, and secured their ascendancy. He died in 1417, leaving only a daughter, Jacoba (or Jacqueline), wife of John of France, who died that same year. Again was Holland rent with civil strife; the Hooks, as before, readily accepting a female sovereign, while the Cods declared for John of Liège. Jacoba was granddaughter of Philip of Burgundy, who behaved very ill toward her; her romantic and sad life has rendered her the most picturesque figure in all the history of Holland; she struggled long against her powerful kinsfolk, nor did she know happiness till near the end of her life, when she abandoned the unequal strife, and found repose with Francis of Borselen, ruwaard of Holland, her fourth husband. Him Philip the Good of Burgundy craftily seized, and thereby in 1433 Jacoba was compelled to cede her rights over the counties of Holland, Zealand, Friesland, and Hainault. Consequently, at her death in 1436, as she left no children, Philip seized on all her lands. He already held much of the Netherlands; he had inherited Flanders and Artois, had bought Namur, had seized Brabant, with Limburg, Antwerp, and Mechlin; he now got Holland, Zealand, and Hainault, with a titular lordship over Friesland; a few years later he became lord also of Luxembourg. By this incorporation with the possessions of the house of Burgundy, the commercial and artistic life of Holland was quickened, but political liberties suffered; for the rule of the "good duke" was far from being good. It was a time of luxury and show, of pageants and display, of the new and brilliant Order of the Golden Fleece (1430), and of the latter days of feudalism, with all its brilliancy, corruption and decline in the presence of the new monarchical spirit of Europe. Holland, however, at first contented herself with growing material prosperity; her herring fishery, rendered more valuable than ever by the curing process discovered or introduced by Beukelzoon, brought her fresh wealth; and her fishermen were unconsciously laying the foundations of her maritime greatness. It was in the days of Duke Philip that Laurenz Koster of Haarlem contributed his share to the discovery of printing; the arts and learning of the Renaissance began to flourish greatly. The Burgundian dukes rivaled their contemporaries the Medici; under them grew up the Flemish school of painters, headed by the Van Eycks and Memling; architecture advanced as stately churches and town-houses were built; the dukes collected priceless manuscripts, founded libraries, and encouraged authors. But this speedy growth in art and letters belonged more to Flanders and Brabant than to Holland or Zealand.

In short, throughout the Burgundian time Holland plays but an insignificant part; and it may merely be remarked that the friendship of the dukes for the nobility did that class more harm than their hostility to civic liberties hurt the towns; for the lavish waste of Philip's court impoverished the nobles, and the wars of Charles destroyed them. After their days the Netherlands nobility were never again powerful. The church also suffered; it was enriched and corrupted by Philip, and was consequently very loyal to him; but his favor instead of strengthening it made the Reformation necessary. The cities, though oppressed and heavily taxed, grew stronger; and, when Duke Charles perished at Nancy, they at once stood out for their rights, and obliged his sole heir, the duchess Mary, not unwillingly, to grant them the "Great Privilege" of March, 1477, which affirmed the power of the cities and provinces to hold diets, and reserved to the estates a voice in the declaration of war, and authority to approve of the choice she

might make of a husband. It was declared that natives alone might hold high office; no new taxes should be laid without the approval of the estates; one high court of justice was established for Holland, Zealand, and Friesland; the Dutch language was made official. Thus came to an end the centralizing despotism of the Burgundian dukes. This period is also remarkable for a reconstruction of the civic government, and for the appearance of the States General, first summoned by Philip the Good. In the states of Holland many nobles sat in person, though they had but one collective vote. At first all towns, larger and smaller, also sent representatives, but after a time the smaller ceased to appear, and only such larger cities as Dort, Haarlem, Leyden, Amsterdam, Gouda, were represented, each having one vote. The president was the "advocatus," or "vogt," of the country, afterward styled "the pensionary," an officer regarded as the champion of the estates against the counts. In Zealand and elsewhere, clergy, nobles and cities sat separately, each order having a single vote. The estates, under the Burgundians, had little power; they could not even control the taxation. Duke Philip in 1464 summoned them to meet him at Bruges, and, though some of the more distant held aloof, the majority obeyed. These States-General, however, expressed no national feeling or union of the provinces; that was a far later state of things.

After Mary of Burgundy had granted the Great Privilege, the provinces warmly supported her against Louis XI.; they approved her union with Maximilian of Austria in August, 1477, though it brought them no rest; for the old parties still survived, and Hooks and Cods fought savagely in almost every town. Maximilian had allied himself with the Cods, and the Hooks were defeated at Leyden and Dort, and finally in their last stronghold, Utrecht, of which city the archduke was made temporal protector in 1483. Before that time (March, 1482), Mary of Burgundy had died, and Maximilian, acting for his son Philip, became governor of the Netherlands. After fresh Hook and Cod troubles at Haarlem, he finally made peace with France in December, 1482, and after the death of Louis XI. brought the Flemings to complete obedience by the peace of Frankfort in 1489. The provinces were still very uneasy, partly through the turbulence of the Hooks, partly because of the autocratic character of his rule, and partly through the so-called "Bread and Cheese" war, caused by famine in the northern provinces. War with France also complicated matters, and the government over the Netherlands was intrusted to Albert of Saxony. In 1494 Maximilian, having been elected emperor, laid down his office as guardian, and had Philip, the Handsome, declared of age. He was at once accepted by Brabant, and the estates of Holland even let him sweep away the Great Privilege. He ruled over them quietly, and got back their English trade. In 1496 he married Joanna of Aragon, daughter of Ferdinand and Isabella, and afterward heiress to the new monarchy of Spain. On Philip's death in 1506, leaving two sons, Charles and Ferdinand, and four daughters, Maximilian again became guardian for his grandson Charles, then but six years old; he named Margaret of Savoy, his daughter, governess of the Netherlands in 1507.

In 1515 Charles was declared of age, and received the homage of Holland and Zealand, Brabant and Flanders, as Count Charles II. In consequence of his friendly relations with Francis I. of France, Henry of Nassau, his comrade and trusted follower, was wedded to Claude, sister of Philibert, prince of Orange, and from this union springs the great house of Orange-Nassau. On his accession to the Spanish and imperial thrones successively, Charles continued his aunt Margaret of Savoy

as governor of the Netherlands, with a privy council to assist her.

He brought all the provinces under one hand, having in 1524 become lord of Friesland by purchase, and in 1528 acquired the temporalities of Utrecht. He now ruled over seventeen provinces, that is, over four duchies—Brabant, Guelderland, Limburg and Luxembourg; seven counties—Flanders, Artois, Hainault, Holland Zealand, Namur, and Zutphen; the margraviate of Antwerp; and five lordships—Friesland, Mechlin, Utrecht, Overysse, and Groningen, with the Ommeland.

After the death in 1530 of Margaret, who had continued to act for him with her accustomed wisdom and prudence, Charles V. at first treated the provinces with studied moderation; he redressed some of their griefs, reformed the administration and the coinage, issued sumptuary edicts, regulated their commerce, while he also reenacted the severe laws against heresy, and gave full powers to the supreme court of Holland—a body completely under his control. He then appointed his sister Mary, queen of Hungary, regent of the Netherlands. She had at first no easy task; for the provinces had on hand a war with Denmark, and Anabaptist troubles at home; before long also she had to ask for increased supplies; and while the Hollanders granted a large annual subsidy, they refused her a hearth-tax which she demanded. Similar monetary questions in 1539 produced that famous struggle between the court and Ghent, which was only ended by the personal intervention of the emperor; after punishing severely the rebellious burghers, he passed on into Holland, and in 1540, in defiance of the acknowledged rights of the provinces, established a foreigner, René of Chalons, prince of Orange, as stadtholder of Holland, Zealand, and Utrecht. He thus forced on them that great family which has both shed luster on the history of Holland, and defended there and elsewhere the liberties of Europe. René himself ruled but a short time; he perished in France in 1544, leaving his territories to a little cousin, William of Nassau.

In 1545-46 the estates gave the emperor men and money for his war against the Protestant princes of Germany; after Mühlberg, the Netherlands hoped that they might now be freed from the foreign troops Charles had quartered among them. He, however, had other plans on hand, and determined to place permanently in the provinces 4,000 horse, entirely at his own orders; he also laid before the estates in 1548 a scheme of incorporation, which aimed at making the Netherlands an integral portion of the empire, under the name of the circle of Burgundy, and which he abandoned only after the refusal of the seven electors to make Philip king of the Romans. In 1549 he revisited the provinces and called Philip thither also, that they might see their future master; the young prince swore to maintain their rights and customs; and so began between the Netherlands and him the formal relation which under circumstance elsewhere related became so real on October 25, 1555.

After appointing Margaret of Parma, a natural daughter of Charles V., to be regent in the Netherlands, in 1559 Philip set sail for Spain, leaving, in spite of the remonstrances of the estates, 4,000 foreign troops, nominally to protect the frontiers, really to check the independence of the people, and to support the policy of religious persecution which had been resolved on.

But at this moment the long labors of the Council of Trent were ending; and, when in 1565 it finally promulgated its decrees, Philip determined to enforce their acceptance throughout his dominions. Accordingly, he now made a more vehement attack on the Reformers; and then it was that, in 1566, the Netherland nobles, led

by count Brederode, signed the famous "Compromise," with which the open rebellion of the provinces begins.

To deprecate Philip's anger at the "Compromise," the council of state sent men of high repute to Spain, where Philip received them kindly, but took good care that they should never again see their homes. Meanwhile he gathered forces with which to suppress the disturbances, which had become very serious. Open-air preachings, guarded by armed men, were taking place throughout the provinces, and raised the excitement to such a height that it at last found vent in iconoclastic tumults similar to those of France. This gave the court party only too good an excuse; it could now interpose with authority on behalf of public order. Matters threatened war. The confederacy was in fact broken up; and Margaret saw with satisfaction a considerable body of German mercenaries enter the provinces to inflict punishment, in all its ghastliest and most brutal forms, on the iconoclasts. In 1567 it came to blows; the undisciplined rabble of Calvinists, who tried to raise the siege of Valenciennes, were cut to pieces by the troops of Egmont and other loyal nobles.

In spite of Margaret, who assured Philip that the heretics were completely put down, and their worship abolished, and that consequently there was no need of an army, and that on the contrary the time for mercy had come, the plan for the utter subjugation of the provinces was adhered to, and the duke of Alva, already famous for his harshness and bigotry, was named commander of the forces, with almost unlimited powers. He set forth in May, 1567, and all hopes of peace or mercy fled before him. There was a great and desperate exodus of the inhabitants; thousands took refuge in England, Germany, and Denmark, carrying with them, it was thought, the last relics of their faith and party. The nobles' confederacy had already been broken up; now the popular movement was dispersed, despair and helplessness alone remained to greet the cold Spaniard and his train of orthodox executioners. He entered the Netherlands with about 20,000 men, all tried troops, ready for any cruelties. Their weakness lay in the fact that they were after all mere mercenaries, — Spaniards, Italians, and Germans, — and as such ever ready for a mutiny, if pay fell short, or if there were none to plunder.

The Council of Troubles — the "Blood-tribunal" — was established; Margaret, thrust aside by the imperious general, resigned her weary office, and carried away with her the last hopes of the wretched people. Alva was now appointed governor-general, and the executions of his council filled the land with blood. Though the Gueux under Louis of Nassau won a considerable victory over the Spaniards at Heiligerlee, the arrival of Alva compelled him to raise the siege of Groningen, and to withdraw toward the Ems. At Jemmingen Louis was at last utterly defeated, and though the prince of Orange did his utmost to raise the country, and skillfully avoided a fatal battle, the campaign ended in his being obliged to withdraw out of the country. Alva was now at the highest point of his success; his statue, cast from cannon taken at Jemmingen, was set up at Antwerp; the exodus of the inhabitants continued incessantly, especially to England. The advice of Admiral Coligny, that the provinces should wage war from the sea, was hardly listened to at first. In 1570, however, Orange turned his attention that way, and his little navy, under William de la Marck, annoyed Spanish commerce and took rich prizes. In 1572, being unable to find refuge in any ports, — for neither England, nor Denmark, nor Sweden would allow them harborage, and they were treated not merely as rebels but as pirates, — William de la Marck, with his "Water-Beg-

gars," suddenly seized on Briel, at the mouth of the Meuse, and the face of the struggle began from that moment to change. Alva, partly from the general requirements of his position, partly from lack of funds and desire of his recently-imposed tenth penny, had at this moment driven the Netherlands to desperation. He was engaged in a struggle with Brussels and Utrecht, in which city, to punish the inhabitants, he had collected his Spanish soldiery from all the neighboring towns. The news of the capture of Briel woke him from his security. Flushing also fell into the hands of the "Water-Beggars," who surprised under its walls a rich convoy from Spain. About the same time, Louis of Nassau, who had been at La Rochelle with the Huguenots, and had received help and encouragement from Charles IX. of France, suddenly seized Mons in Hainault, thus giving the French sympathizers with the revolt the means of entering safely into the Walloon provinces. Alva, now seriously alarmed, withdrew from Zealand the whole of the forces with which he had intended to check the movement of the "Water-Beggars," in order that he might repair the great breach thus made in his southern system of defense, and so left the province free to develop its resistance. Holland followed quickly, Enkhuizen setting the example; so that, within three months of the capture of Briel, Amsterdam was the only town in Holland in the hands of the Spaniards. In Friesland also the revolt spread far and wide. The states of Holland met, and, acting under advice of Philip of Marnix, lord of St. Aldegonde, the prince's deputy, declared that William of Orange was, by Philip's nomination, stadtholder of Holland, Zealand and Friesland; they also declared their intention to raise money for the costs of war and the relief of Mons, and affirmed again the liberties of the provinces; finally they named the rough and ready William de la Marck captain-general — a man whose prompt and practical daring would supply the qualities which the caution and apparent irresolution and timidity of William of Orange seemed unlikely to provide for the emergency.

Meanwhile Alva pressed the siege of Mons; French help failed utterly to relieve Louis of Nassau, nor could William of Orange either force his way through the Spanish lines or induce Alva to fight. At this moment came tidings of the massacre of St. Bartholomew, and the prince, seeing that all hope of aid from France was utterly at an end, bade his brother make the best terms he could, and withdrew beyond the Rhine and thence into Holland. Mons at once capitulated, and Alva, passing on to Mechlin, pitilessly sacked that wealthy city. Thence he pressed forward to the north; Zutphen was taken, the towns of Guelderland and Friesland submitted, and for awhile nothing seemed to stay his career of conquest and revenge. The prince of Orange was powerless; but the despair caused by the cruel destruction of Naarden roused a spirit which even Alva could not tame, and the famous siege of Haarlem, lasting through the winter of 1572 till July, 1573, cost 12,000 Spanish troops, and gave the insurgent provinces time to breathe. A great mutiny among Alva's troops still more hindered the work of subjugation. The repulse of Don Frederick of Toledo, Alva's son, from Alkmaar, the capture of Geertruidenberg by the Dutch, and Admiral Dirkson's great victory over Alva's fleet, entirely changed the aspect of affairs, and saved the towns of North Holland. Alva, who had come as far as Amsterdam, returned to Brussels, and thence, obtaining his recall, bade farewell to his government. During the six years it had lasted, his executioners had put to death 18,000 persons, to say nothing of the victims in cities captured by his troops; the Spaniards plundered where they could, and considered the whole wealth of the Netherlands their lawful

prey, forfeited by rebellion. But his pitiless severity only served to raise up a stubbornness of civic resistance, against which the tried discipline of the Spanish soldiery, and the consummate skill of their commander, reckoned to be the first general in Europe, were powerless.

Don Louis of Requesens, grand-commander of Castile, was appointed Alva's successor, and after a brief and deceptive lull the war went on. In January, 1574, by the fall of Middelburg, the Spaniards lost their last hold on Walcheren and on Zealand, while by the splendid defense of Leyden, unparalleled in the history of heroic endurance, their efforts in another direction were effectually frustrated. After fruitless negotiations with Philip, the estates of Holland, in November, 1574, formally offered to William "the Silent," prince of Orange, full authority by land and sea, with the title of governor or regent. Conferences were also held, with a view to peace, at Breda; and on their failure, in the summer of 1575, Holland and Zealand drew up articles of union, and an ordinance for their joint government under the prince of Orange. By it he received supreme command in war and absolute authority in all matters of defense, the control of all money voted by the estates, the maintenance of the laws as count, in the king's name, the ultimate appointment (after nomination by the estates) of all judicial officers. He undertook to protect Calvinism, and to suppress "all religion at variance with the gospel," while he forbade all inquisition into private opinions. These terms accepted, William became, in spite of their nominal recognition of Philip, the true prince of the two provinces. Still this union, brought about by the prince's personal character and ability, and by the popular faith in him, was distasteful to the larger cities. Already we may note the beginnings of that party division which was afterward so prominent, and divided Holland between the land-party, popular, quasi-monarchical, Calvinistic, headed by the Orange-Nassau family, and the sea-party, the town-party, headed by the burghers of Amsterdam, Arminian, civic, and aristocratic.

Meanwhile the grand-commander made a successful attempt on the Zealand coast. His troops took Duiveland, and laid siege to Zierikzee, chief town of Schouwen, and key of the whole coast. The two provinces, unable to relieve the place, were driven to consider their position. So long as they paid any allegiance to Philip of Spain, against whom they were struggling for life, they could never get much help from any other prince, nor were they strong enough to assert their own sovereignty. Three powers lay near them: the empire, already connected with them by old relations, and by the family connection of the house of Orange-France, with her restless Valois dukes, ready for any venture, whether in Poland, England, or Holland; and, lastly, England, whose queen knew well that Philip was her foe, and that the Low Countries might effectually hinder his efforts against her. The provinces, though William had suggested it, refused to deal with the emperor, and turned to Elizabeth; she brought them little real help, and they seemed to be on the very brink of ruin when fever carried Requesens off in March, 1576.

The breathing space thus gained enabled them to strengthen their union under William; but before the question respecting the position of the duke of Anjou could be settled, the siege of Zierikzee drew to an end. Boisset perished in a too gallant attempt to break the league, and the town yielded. Things looked ill for the patriots, and Zealand would have been at the mercy of the conqueror, had not another great mutiny neutralized the success of the victors; the Spanish and Walloon troops left Zealand and, headed, as usual, by their

"electo," marched into the richer plains of Brabant, seizing Alost, whence they threatened both Brussels and Antwerp. One of the results of the panic they caused in Brabant was the capture of Ghent by William. Brussels was only saved from being pillaged by them by the vigor of the inhabitants, who armed in their own defense. Suffering under a powerless administrative, and smarting from the curse of foreign soldiery, the southerners now began to wish for freedom and union with the other provinces. The broad liberality of Orange, moderating the Calvinism of the people, enabled the two groups to draw together. In October, 1576, a congress of the States-General of the provinces met at Ghent; the council of state at Brussels was forcibly dissolved; the frightful "Spanish Fury" at Antwerp struck such terror into all hearts that a treaty was concluded in November, 1576, under the title of the "Pacification of Ghent." It was received with great enthusiasm; in it the provinces agreed first to eject the foreigner, then to meet in States-General and regulate all matters of religion and defense; it was stipulated that nothing should be done against the Catholic religion; the Spanish king's name was still used; the prince of Orange was recognized only as stadtholder of Holland and Zealand. All the seventeen provinces accepted the Pacification; and for a brief space the "United Provinces" really did exist.

Early in January, 1577, the "Union of Brussels" was put forth. The document engaged all who joined to help in ejecting the foreign troops, in carrying out the Pacification, in maintaining the Catholic faith, in recognizing Philip's sovereignty, in defending the liberties and constitutions of the provinces. It was eagerly adopted; and even Holland and Zealand made no demur. When the paper, crowded with signatures, was laid before Don John of Austria, who meanwhile had arrived as regent, he also accepted it; and on February 17, 1577, was signed the "Perpetual Edict," which ratified the Pacification of Ghent. Not till the troops were gone should Don John be received as governor-general. Philip II ratified the edict a few weeks later.

Yet, after all, unity did not ensue from it. The natural divergency between north and south at once appeared; in character, in interests, above all, in religion, they had little in common; and when William of Orange refused to publish the edict in Holland and Zealand he was warmly supported by these provinces. This is perhaps the real point at which Dutch independence begins. Don John entered Brussels in triumph, and, by conciliation and winning manners, had already broken up the union; the whole of the southern provinces withdrew from it at once, and that well-marked difference in political life, which, after so many changes, still distinguishes Belgian from Dutchman, was from that moment made clear. Yet, though Don John had achieved so much, the result, after all, disappointed him; he was surrounded by difficulties, suspicions and plots; he saw the failure of his larger schemes, and only the partial success of his effort to reduce the Netherlands; he recognized the dangers which the abilities and rivalry of William of Orange were preparing for him. This was soon shown in the seizure of Antwerp citadel by the patriots, and in the destruction of the hated fortifications, so long the sign and efficient cause of their subjection. Other castles, such as that of Ghent, were razed to the ground as soon as the fall of Antwerp citadel was known. Still less was Don John pleased by the election of his rival as ruwaard of Brabant, and by his enthusiastic reception at Brussels. The States-General (December 7, 1577), declared strongly against Don John's authority.

It was clear war must begin again; and the patriots raised an army nearly 20,000 strong, which was utterly

defeated by Don John and Alexander Farnese, at Gembloux near Namur. But their campaign was wasted on isolated movements and town-taking, while William of Orange fell back unmolested to Antwerp. A sudden illness, so sudden as to arouse the common suspicion of poison, carried off the conqueror of Lepanto (October 1, 1578), and Alexander of Parma succeeded him in the government.

The struggle had now entirely passed into the southern provinces; Holland and Zealand were left to gather strength; the recovery of Amsterdam (1578) removed the one hindrance to their prosperity. While the south trusted to foreign help, some John Casimir, or duke of Anjou, the north quietly consolidated itself. In January, 1579, was proclaimed the famous "Union of Utrecht." The document professed to make no changes; it would but carry out the Pacification of Ghent by a closer junction of Holland and Zealand with Friesland, Guelderland with Zutphen, Utrecht, Overijssel, Groningen; united as one, these provinces should still retain their local uses and privileges. So long as the archduke Matthias, who had been appointed governor-general in 1577, remained, his authority would be respected; on his withdrawal in 1580 the States-General named as stadtholder William of Orange, who had already exercised the real authority over the provinces. A considerable number of southern cities, Ghent, Antwerp, Bruges and others, as well as some of the nobles, also joined this union. Thus did the United Provinces at last come definitely into being.

During the next five years Spain devoted her efforts to the southern provinces alone; the union was unmolested. The Walloon provinces were reconciled to Spain; the others, with the exception of Holland and Zealand, had accepted the duke of Anjou as their sovereign; Holland and Zealand had proclaimed William of Orange as their chief, though he did not finally accept sovereign power and the title of count till August, 1582; by a sort of cross-division, the seven northern provinces, meeting at the Hague, had (July 26, 1581) made an "Act of Abjuration," and had issued their "Declaration of Independence," the five naming Anjou, the two William, as their sovereign in Philip's stead. Then Holland and Zealand framed an independent constitution, conservative of their ancient liberties, as expressed in the "Great Privilege of the Lady Mary;" they declared themselves a free country, severed alike from Spain and from the empire.

But Spain was not yet ready to take up this challenge; and, meanwhile, she resorted to other weapons. A scandalous proclamation, offering rewards and honors to any ruffian who would serve church and king by murdering William of Orange, was now issued; and, roused by the double inducement, after many unsuccessful attempts, a paltry wretch (July 10, 1584) succeeded in assassinating the greatest man of his age, the worthy "Father William" of the Dutch, and the only ruler in the world's history who may be fairly compared with Washington.

Fortunately for the Provinces and for the world's liberties, the spirit of William of Orange survived in his second son Maurice, who now, though he was only seventeen and a student at Leyden, and though he had an elder brother living in Spain, was at once, chiefly through the influence of that great statesman, John Olden Barneveldt, named governor of the United Provinces, with a council of state, and with Count Hohenlohe, his brother-in-law, as lieutenant-general. He was also, soon after, made stadtholder of Holland and Zealand, while Utrecht was placed under the lord of Villars as stadtholder, Guelderland and Overijssel under the count of Meurs, and Friesland under William of

Nassau. Never was anyone better fitted for his life's task than was this boy, thus early called to rule in troubled times. For Maurice of Nassau had all the coldness and calculation of his family, all its ambition, all its firmness and tenacity of grasp, while he added thereto a quality wanting in the others, a genius for war, and those gifts which go to make what is commonly called a lucky commander — gifts which may be best described by saying that the lucky captain is he who in war leaves least to luck. For over forty years Maurice was the champion of the provinces; and, if we except his treatment of Barneveldt, we may say that he comes next after his father as a founder of the Dutch republic.

At the outset his antagonist was that formidable captain, Alexander Farnese, who had by this time nearly subdued all the southern Provinces, and whose arms proved successful at Ghent (1584) and at Antwerp (1585). The northern provinces, thinking it necessary to call in foreign aid, appealed to Henry III. of France, but the outburst of the "War of the three Henries," caused by the anxiety of the Guises lest Henry should draw too much toward the heretics, put a stop to all hope of help from that side. Olden Barneveldt, therefore, next crossed over to England with offers to Queen Elizabeth, who, though declining for herself the proffered sovereignty over the Provinces, undertook to appoint a governor-general, and to send over and pay 5,000 foot and 1,000 horse; in return for which she was to be put in possession of certain cautionary towns. Accordingly, Sir John Norris was at once sent over with the English forces; Sir Philip Sidney was appointed governor of Flushing, and the earl of Leicester was named governor-general by the queen. At first Leicester was welcomed with all the joy that his Calvinistic opinions, and his position as favorite and representative of Elizabeth, could elicit in the breasts of men who had now long been struggling for existence, and who, bereft of their great prince, were yearning for some strong hand to guide them. But it did not last; his high pretensions and his mistress' haughty tone, joined with his foolish interference with Dutch commerce and with the religious difficulties now beginning to show themselves, soon offended the States-General, and neutralized whatever good the active help of England might have promised them. In 1586 Sir Philip Sidney invaded Flanders, and the young stadtholder of Holland gladly served under him. In the same autumn Leicester himself took the field, and marched to meet Parma, who was threatening the provinces from the east. Under the walls of Zutphen Sir Philip Sidney fell; and Leicester, finding his efforts useless, soon raised the siege of that town, and withdrew to the Hague. The rest of his time was spent in bitter quarrels with the estates; Olden Barneveldt and Maurice were united for a time by his marked ill-will toward them both; and so strong did the feeling against him grow, that, in 1587, Queen Elizabeth was fain to order his recall. For a while there was great soreness between the countries; the general interest, however, was far stronger than any partial pique, and in the crisis of the Spanish Armada in 1588 the Dutch did very great service to England by resolutely blockading in their ports the transports and army with which Parma had meant to invade the English shores. In the same year Maurice had the satisfaction of seeing the English and Dutch repulse the famous duke from the walls of Bergen-op-Zoom. In 1589, on the other hand, the English garrison of Geertruidenberg betrayed that important place, the doorway out of Brabant into Holland, into Parma's hands, and laid the United Provinces open to attack. In other places also the English forces, not yet withdrawn, were an anxiety and danger to the States. Still,

from this moment the fortunes of the Dutch began to rise.

The year 1590 opened well for the United Provinces; Utrecht joined its fortunes with those of Holland and Zealand; Guelderland and Overysse made William Louis of Nassau their stadtholder, so strengthening the power of the family; and Breda was recovered by a daring stratagem. The duke of Parma also, with failing health, was called away to oppose the victorious progress of Henry IV. in northern France. In 1591 Prince Maurice still further strengthened himself by taking Zutphen, Deventer, Hulst, and eventually Nimeguen, which secured for him the complete submission of Guelderland. Parma was unable to oppose him effectually, for his troops were again mutinous; he was also once more called off into France. The reputation of Prince Maurice rose now to its highest point; the greatest captain in Europe seemed unable to cope with him, and the vigorous help of Barneveldt still secured him firm support at home. In 1593 he took Geertruidenberg; and in 1594 Groningen, the only stronghold left to the Spaniards in all the Seven Provinces, was reduced.

The appointment of the cardinal archduke Albert as governor of the Spanish Netherlands did not much change the current of affairs; the Dutch now tried to open up a trade with the East Indies, and made some vigorous explorations in Arctic seas. In 1596 the archduke recovered Hulst, which commanded the northernmost parts of Flanders; the Dutch, on the other hand, with the English, sacked Cadiz and destroyed the Spanish fleet; and in the next year Maurice inflicted a defeat on the Spaniards at Turnhout, transferred his sphere of action to the Rhine country, and took town after town, making the provinces secure on the side of Zutphen, Overysse and Friesland. The year 1598 gave a new aspect to affairs by the conclusion of the Franco-Spanish war in the treaty of Vervins, and by the death of Philip II. The Dutch, assisted only by the English, and that chiefly by volunteers, were now to bear the whole brunt of the efforts of Spain. In the autumn of 1599 Prince Maurice endeavored to transfer the war into Germany; and after taking Emmerich in the Cleves country, delivered Bommel from the siege which Mendoza, the Spanish general, was laying to it. But dissatisfaction at home, and the unreadiness of his German allies, forced Maurice to turn his eyes toward Flanders, which he invaded in the summer of 1600. Surprised by the Spaniards in the neighborhood of Nieupoort, Maurice was attacked by the Archduke Albert in a most critical position, but, after a long and well-balanced battle, inflicted on him (July 2d) a disastrous defeat. Maurice could not, however, take the town, and winter put a stop to the campaign without any great change in the relative position of the belligerents. In 1601 the archduke began the famous siege of Ostend, which lasted three years and two months; the losses on both sides, more especially among the Spanish, were immense. While it continued, the coolness between the States-General and Maurice steadily increased; for they thought his cold, ambitious nature capable of anything, and saw with fear the paramount influence he had over the army. Their instincts led them to rest on the ships, to prefer peace to war, and commerce to glory. It was during the siege of Ostend that they established the Dutch East India Company in 1602, though its basis had been laid down by a group of Amsterdam traders in 1595.

In 1604 Maurice took Sluis, and Ostend at last fell to Spinola. Thenceforward the main lines of the struggle by land were simple enough; the Spaniards tried to transfer the seat of war into the United Provinces, and

were steadily foiled by Maurice. All the while the States-General aimed at peace, though the naval war became vigorous as that on the land languished. The sea fight off Gibraltar in 1607 utterly ruined the Spanish fleet, and left her commerce powerless. At last, after long negotiations, which served to emphasize the variance between the patriot party, headed by Barneveldt and Grotius, and the war party, which included the official classes, the army, navy, East India Company, the clergy, and the populace in the towns, a truce for twelve years was signed, on the *uti possidetis* ground, between Spain and Holland. In the war the Dutch had added Overysse and Groningen to the union; they held Sluis, Hulst, and other ports on the Flemish side, in what is called "Dutch Flanders;" they had Bergen-op-Zoom, Breda, and Herzogenbusch on the Brabant frontier, and the forts which commanded the Scheldt and strangled Antwerp for the sake of Amsterdam; lastly, they were become lords of the sea, and the chief traders of the world.

After a brief interference in the affairs of Germany where the intricate question of the Cleves-Juliers succession was already preparing the way for the Thirty Years' War, Holland settled down into that hot and absorbing theological struggle, which was closely mixed up with political questions, and which stained with a deplorable triumph the last years of the career of Maurice of Nassau. In 1603 Jacob van Hermansen, or, in Latin form, Arminius, had been appointed one of the two professors of theology at Leyden, Francis Gomar being the other. The two men took opposite sides with zeal, Arminius assailing and Gomarus defending the current popular theology. The views of Arminius spread fast among the upper classes, especially in the larger towns, and became the theology of the civic aristocracy; the established opinions were tenaciously supported by the bulk of the clergy, the peasantry, the town populace, the army, and the navy. At their head stood Maurice, ready to use the strength of Calvinistic feeling to secure his own authority, however little he might care for the tenets of his side; at the head of the other party, more philosophical, less in earnest, perhaps, was Barneveldt, with the town traders. King James of England as yet supported the Calvinists, and with Archbishop Abbot influenced greatly the proceedings of the famous synod of Dort (1618) in favor of Prince Maurice and the anti-Remonstrants. The result of the synod enabled the prince, for his own political purposes, to crush the aristocratic party. Barneveldt and Grotius (another leading Remonstrant) were seized, and in spite of all his great service to his country, his venerable age, and his past support of Maurice, the pensionary was brought to an infamous trial and executed at the Hague in 1619. Grotius afterward escaped from prison and took refuge in France. The silenced Remonstrants, finding that there was no hope of toleration for them, left the country in great numbers, and formed a prosperous settlement in Holstein, in 1621, where they founded the town of Frederickstadt on the Eider.

In 1621 the truce with Spain came to an end, and the Dutch were at once involved in the vortex of the Thirty Years' War, which had now been going on for a couple of years. Spinola, after taking Juliers, attempted Bergen-op-Zoom, hoping thereby to open a passage into Zealand; he was, however, foiled by Maurice. About this time a great coolness sprang up between Holland and England, the beginning of the deadly rivalry which lasted so long. King James was eager to gain his objects without fighting, and to be on friendly terms with Spain; he and Laud were opposed to the Calvinism of the Dutch, and disliked their form of church government; and commercial jealousy was already beginning to arise. Suc-

cesses and losses were evenly balanced in the war: the Dutch recaptured Juliers and took Cleves, while Spinola, after great losses caused by the gallant defense of the English, in 1625 took Breda. A few days before the town fell, Maurice died, leaving the Spaniards in the heart of his territories, and the Dutch vexed with religious and domestic factions.

His brother, Frederick Henry, of Orange-Nassau, succeeded him as stadtholder of Holland, Zealand, Guelderland, Utrecht and Overijssel. The war by land became utterly spiritless, though by sea the Dutch still asserted their maritime supremacy. By land the chief operations were the siege and capture by Frederick Henry of Herzogenbusch, Maestricht and Wesel in 1628; by sea the Dutch interfered, much against the popular feeling, to assist the French court against the Huguenots at La Rochelle. They blockaded Dunkirk, whence Spanish privateers had been wont to harass their commerce; under Piet Heyn, of Delftshaven, boldest of their sea-captains, they vexed the Spanish coasts, captured Spanish war ships, carried off their "silver fleet," and, finally, in 1631, won, near Tholen, a brilliant victory over a great Spanish fleet commanded by Count John, of Nassau, who was endeavoring to make a descent on the Zealand coast.

In this year the States, feeling that the moderation of the stadtholder was honest and salutary, that his influence alone seemed able to quiet the rage of religious faction, and that his military operations had secured the confidence of the provinces, took the important, and, as it turned out, the unwise step of securing to his infant son the reversion of all his great offices of stadtholder, captain and admiral-general. The Calvinists were willing to grant so much to the head of their party, and made no objection to the introduction of the principle of hereditary succession; while the Remonstrants, discerning that Frederick Henry, like his brother before him, was personally more favorable to their tenets than to those of their adversaries, accepted the measure in the hope that when permanently established as their prince, he would carry out those tolerant views which he was known to hold.

In 1632 he justified their confidence by his masterly siege and capture of Maestricht, in defiance of all the efforts of the Spanish and imperial generals; Namur, Luxembourg, and eastern Brabant were laid under contribution in consequence, and the States defended from danger of attack toward the east. As the war dragged on after the death of Gustavus Adolphus of Sweden, France and Holland drew more together, and 1635 an alliance and partition treaty was made between them, in which it was proposed that the Spaniards should be driven out of the Netherlands, which should be made an independent state, guaranteed by the allies; that France should receive, as her share, the seacoast up to Blankenberg, together with Thionville and Namur; and that a corresponding portion should be given to Holland; if this scheme of an independent state proved a failure, then France and Holland should divide the whole district between them. The joint operations consequent on this agreement proved a failure; Frederick Henry had always been opposed to the alliance, and probably did not wish it success; the divergence between him and the States-General at this time gave Cardinal Richelieu the opportunity of restoring the Remonstrant party to Holland, and making it French in sympathy, in opposition to the House of Orange—a combination of which Louis XIV. afterward made great use. In 1637 the stadtholder recovered Breda, though the gain was balanced by the loss of Roermond and other places; and in 1638 the war was favorable to the Spaniards. In 1639, however, a series of great naval triumphs

under Tromp and De Witt turned the scale in favor of the Dutch.

In 1640, on the death of Count Henry of Nassau, stadtholder of Friesland and Groningen, the latter province chose Frederick Henry as its stadtholder, and he thus became chief of six out of the seven United Provinces; in the next year he was able to arrange the marriage of his son William with Mary, eldest daughter of Charles I. of England, a match devised by the queen-mother of France, while a refugee in Holland, in order to increase the ill-will between Richelieu and the stadtholder. Thus began the dynastic relation between the Stuarts and the house of Orange, which led to such great results before the end of the century. The States-General were not too well pleased with this alliance, and looked shyly at Henrietta Maria when she came over to Holland to get help for Charles I. in 1642. They were becoming alarmed at the great power and ambition of France under Richelieu, while they sympathized to a great extent with the English Puritans.

All parties, except the French, being now utterly weary of the war, negotiations for peace, long talked of, long prepared for, began in earnest at Münster and Osnabrück. Before their close Frederick Henry died in 1647, and was succeeded in his dignities and offices by his young son William II., and almost immediately afterward (January, 1648), in spite of the opposition of France and the young prince of Orange, the deputies of the Provinces (with exception of Zealand and Utrecht) signed a separate treaty of peace with Spain, which was confirmed and sworn to in May at Münster. It was a complete surrender of everything for which Spain so long had fought. The United Provinces were recognized as free and independent, and Spain dropped all her claims; the *uti possidetis* basis was adopted in the matter of all conquests; the two contracting parties agreed to respect and keep clear of each other's trading-grounds; each should pay, in the ports of the other, only such tolls as natives of the other paid; the Scheldt was entirely closed by the States, so that Amsterdam might strangle Antwerp—the chief harbor of the free Provinces—thus ruining the chief harbor of those still subject to Spain. And so ended the so-called Eighty Years' War.

No sooner was the peace concluded than bitter disputes arose between Holland, on the one hand, and the prince of Orange, supported by the army and navy and the smaller provinces, on the other. He was tempted into foolish acts: he arrested six of the deputies of Holland, he even tried to surprise and occupy Amsterdam; he favored the English royalists, now plentiful in the Provinces, while Amsterdam and Holland inclined toward the Commonwealth. Things went so far that William II. had almost destroyed the liberties of the Provinces, and was intent on two schemes—the resumption of war against Spain, with a partition with France of the Spanish Netherlands, and interference on behalf of Charles II. in England—when his opportune death by small-pox occurred. A few days afterward his widow, Mary of England, gave birth to a son, who was destined to be the most distinguished man of his race, William III. of Holland and England.

For a time the death of William II. restored the burgher-party to power, and made Amsterdam the head of the United Provinces. Holland triumphed over Zealand; the house of Orange, friend of the Stuarts, seemed to suffer eclipse with them; and though the royalist mob even at the Hague, set on by a princely rough of the palatine house, made it impossible for the envoys of the English Commonwealth to come to terms with the republic, still the popular monarchical party

was in fact powerless in the Province for more than twenty years. It was with a view to the security of this aristocratic government that a great assembly of the Provinces was held in 1651, and established that form of rule which Sir William Temple has so well described in his *Observations upon the United Provinces of the Netherlands*.

There were four chief elements in that federation:—the terms of the Union of Utrecht (1579); the claims and position of the house of Orange; the sovereignty, within its own borders, of each province; and lastly, the liberties and power of the cities. In the last two the lead was taken by Holland: Holland was the chief province, and Amsterdam, its capital, the chief city of the union. And these two parts of the federation were at one also in their resistance to the house of Orange, of which the chief strength lay in Zealand. The union was governed, in theory at least, by the States-General of the provinces, which met at the Hague, and consisted of a fluctuating number of deputies (sometimes as many as 800), and was supplemented by a permanent council of state, a kind of cabinet composed of twelve deputies from the provinces, and a chamber of accounts. Besides this body each province had its own estates, and each great city its own senate. Thus Amsterdam was ruled by a senate of thirty-six burghers, who kept order, administered justice, and raised local taxes. The office of senator was for life, originally by election of the whole body of freemen, but from the sixteenth century by coöperation, so that the government of the city became a close oligarchy. The chief towns followed Amsterdam in this direction. The senate elected the deputies of the city to the states of Holland.

At first William the Silent had been governor of the Provinces, nominally at least under the king of Spain; and in the reconstruction he secured his own rights, while the sovereign power was transferred to the States General. They took the right of making peace and war, of concluding alliances, of taxing and coining. The governor had all military commands, had power to pardon, and controlled the civil appointments; he represented the dignity of the state, with a court and guards, and envoys from other lands. Each province had its own stadtholder, an office in name at least derived from the Spanish times; each town had its own pensionary or chief minister. But after the death of William II., the office of Stadtholder of Holland was for a time suspended; there was no captain-general or admiral; and the grand pensionary of Holland, first minister of the state, became virtual president of the republic, as we see in the case of John de Witt and Heinsius.

When the English envoys returned to tell their masters, the Commonwealth, of their failure at the Hague, parliament at once replied by passing the memorable Navigation Act of 1651, which aimed at destroying the carrying trade of the Provinces. The struggle for the lordship of the seas which ensued, and with which the names of Tromp and Ruyter, Blake, and Monk are so splendidly associated, was waged with equal bravery and nearly equal success on both sides, until 1654, when peace was made by the Amsterdam burgher-party. By the terms of the treaty with Cromwell the Orange-Nassau family was altogether to be excluded from the stadtholderate of Holland, the other Provinces reserving their independence, and the Dutch populace also much disliking the peace. England preserved the honor of her flag, while Holland was seen to be a worthy and equal rival for the command of the sea.

Hostilities between the Dutch and Portuguese respecting their rights in Brazil followed, in which, after each side had done much damage to the other, peace was also made; and Holland in 1658 interfered to save the Danes

from Charles Gustavus of Sweden. In 1659 a treaty of peace was made between France, England, and the United Provinces, with a view to the settlement of the Dano-Swedish question, which ended in securing a northern peace in 1660, and in keeping the Baltic waters open for Dutch trade. Since the abolition of the stadtholderate after William's death in 1650, the center of authority had lain in the hands of John de Witt, the sagacious leader of the anti-Orange or Amsterdam burgher-party; and he guided the foreign affairs of the provinces in such a way as to secure the fair development of their commerce on every side.

The momentous year 1660 was almost as critical for Holland as for any state of Europe. Charles, in England, having reëlected the Navigation Act, war again broke out in 1665, and the duke of York took the command of the English fleet. At the beginning of June he met the Dutch admiral, Opdam, and, after a close-fought battle off Lowestoft, the English were completely victorious. But, so bad was the condition of the home government in England, that in the following year, the Dutch had by far the stronger fleet at sea, and for a time held their own in the Channel. The four days' battle (June 1-4), between Prince Rupert and Monk on the one side, and Ruyter on the other, ended in an uncertain victory for the Dutch; but on July 25th they were decidedly defeated off the North Foreland, and driven back to their own shores with immense loss. The English were now masters of the sea; but both parties needed peace, and negotiations began at Breda. In the course of these, Ruyter suddenly sailed up the Thames, nearly to Gravesend, and struck terror into the very heart of London, which thus became all the more eager for a settlement. In July, 1667, a treaty between England and Holland was signed at Breda; and in the following year Sir William Temple accomplished the triple alliance of England, Holland, and Sweden, against the aggressive views of Louis XIV., a hollow affair, and pernicious in its results to those who made it. It made Louis XIV. determine to take vengeance on the United Provinces and on the De Witts; it led at once to the humiliation of England by the treaty of Dover (1670), to the overthrow of the Amsterdam party, and to the miserable end of the De Witts; and it eventually raised the prince of Orange to supreme authority in the United Provinces.

From 1668 to 1672 Louis XIV. made ready to destroy the Dutch; and so well had his diplomacy served him that they were left without a friend in Europe. In 1672 the storm broke: the English, without a declaration of war, tried unsuccessfully to intercept the Dutch Mediterranean fleet; and France at once set forth to conquer the hated tradesmen of the north. The States were ill-prepared on land, though their fleet was strong and ready; party spirit was exceedingly bitter, and the ruling party, well aware that the prince of Orange was very popular with the land forces, had utterly neglected their army. On May 28, 1672, Ruyter fought a great naval battle in Southwold Bay (Solebay) against the duke of York and Marshal D'Estrées: the French held aloof, pleased to see the Dutch and English destroy each other; the English suffered most, but as the Dutch withdrew to their own ports, the others claimed the victory. Meanwhile Louis XIV. crossed the Rhine and threatened Amsterdam (see FRANCE). The young prince of Orange alone seemed to rise to the occasion; while others were panic-stricken, sending embassies of submission to the haughty monarch, making preparations for a great flight by sea, William with his miserable army did his best, and aroused so strongly the feelings of the people that Amsterdam, passing from dejection to despair and thence to reckless enthusiasm,

rose against the De Witts and foully murdered both in the streets. They had just before proclaimed William stadtholder of Holland with powers unlimited. And thus Louis XIV. destroyed the proud republic, though in so doing he had raised up the most formidable enemy he was destined to encounter. His invasion did not prosper; other nations began to take up the Dutch cause; Germans and Spaniards threatened the embarrassed French army in the Provinces; so that in 1674 France was on the defensive on every side. William of Orange in that year was defeated at Senef, and had to abandon his plan of penetrating into France, and in 1675 the death of Marshal Turenne, and the retirement of the great Condé, turned the tide of war in favor of the Dutch, except on the sea, where the French fleet defeated and destroyed in the Mediterranean (in 1676) the united navies of Holland and Spain. In 1677 negotiations for peace went on, and were hastened by the marriage, at the close of the year, of William of Orange with the Princess Mary, daughter of the duke of York. At last, in 1678, came the great peace of Nimeguen, which secured the independence of the Dutch.

The aggressive policy of Louis XIV., in the years which followed the peace of Nimeguen, enabled William to lay the basis of the famous confederacy which changed the whole front of European politics. Brandenburg, Denmark, and England sided with the French king; while the league of Augs-burg (1686), following directly after the revocation of the edict of Nantes, placed William at the head of the resistance to French domination. The league was joined by the emperor, Spain, the United Provinces, Sweden, Bavaria, and other German princes. The accession of James II. to the throne of England made it easy for the stadtholder to keep up close relations with the malcontents in church and state, who regarded him and the Princess Mary as the natural successors to the English throne. On the birth of the prince of Wales the anti-Catholic feeling in England at last grew so strong that William was able to interfere with success; while the diversion of the attention of Louis XIV. from Holland to the Rhine relieved the timid rulers of Amsterdam from all anxiety. The Revolution of 1688 ensued, and England became, under William's strong rule, the chief member of the great coalition against France. In the grand alliance of 1689-90, he clearly sacrificed Dutch to English interests, and carried through his policy in spite of great irritation in Holland and Zealand. His power seemed almost autocratic, and the States impotent. Henceforward their part in history becomes quite secondary compared with that of England, and we may refer for details of the great wars to the articles ENGLAND and FRANCE.

In 1690, Waldeck, commanding the Dutch, was defeated by Luxembourg at Fleurus; and the Anglo-Dutch fleet was also severely handled off Beachy Head by the French, who inflicted terrible losses on Dutch commerce. In 1691 the French took Mons; in 1692 the allied ships ruined Tourville's fleet off La Hogue, and recovered the command of the sea. On land the allies fared ill; Louis took Namur, and after a hard-fought battle William was defeated at Steenkirk; in 1693 the Dutch shared in the defeat of Neerwinden, and were not fortunate even on the sea. In 1695 the tide of affairs had turned, and William retook Namur, his greatest triumph after the battle of the Boyne. Negotiations for peace, first attempted in 1694, led to the peace of Ryswick in 1697, in which William was recognized by France as king of England, the Dutch obtaining a favorable commercial treaty, and the right to garrison the Netherlands barrier-towns. Holland was still an important factor in the balancing system, rendered

necessary by the ambition of France. Louis XIV., however, held himself little bound by the peace. In 1701 he elbowed the Dutch troops out of the barrier-towns; he defied England by recognizing James III. on the death of his father; and it was clear to all that another war was imminent, when William III. died in 1702. He had been made hereditary stadtholder in five of the Provinces in 1672; but as he left no children as heirs, the old opposition of Holland to his house again sprang up, and, led by the grand pensionary Meinsius, Amsterdam successfully asserted her independence, and ruled throughout the coming struggle against France with energy and credit.

When war was declared in 1702, Marlborough was named commander-in-chief of English and Dutch troops, and thenceforward became the chief man in the famous "triumvirate" of Marlborough, Meinsius and Prince Eugene. In 1703 the Dutch invaded Flanders, and fought the drawn battle of Ekeren; in 1704 they and the English took Gibraltar; in the same year they took part in the great battle of Blenheim. In 1705 Marlborough led them into the Netherlands; but, hampered by the deputies of the States, he achieved little. In 1706 he won the battle of Ramillies, and swept the French out of the Netherlands; in 1708 came Oudenarde, and after it an unsuccessful attempt of Louis XIV. to detach the Dutch from the alliance; in 1709 the terrible battle of Malplaquet and the capture of Mons. After this great changes followed in England, and Marlborough's power came to an end. Negotiations for peace, often tried before, drew toward success in 1712, and in 1713 the peace of Utrecht was signed. While France received Aire, St. Venant, Bethune and Douay, the Spanish Netherlands were formally handed over to the United Provinces, which in their turn passed them on, after conclusion of a barrier treaty, to Austria; henceforth they are known as the Austrian Netherlands. A favorable commercial treaty was also made between the Dutch and France. The peace of Utrecht made the republic almost as powerful on shore as she had been by sea; at the same time it taught her that the great powers around her would use her resources for war, and abandon her when they wanted peace; she, therefore, determined henceforth to stand clear of all foreign complications. With 1713 the importance of Holland in European politics comes almost to an end.

The ruling party in the States took an active part in securing George I. on the throne of England; and on the death of Louis XIV. in 1715, the old ill-will between France and the provinces died entirely out, so that they were secure in a position of tranquillity; they also brought to a fair conclusion their difficulties with Austria on the subject of the Netherlands barrier. These, however, began again when in 1723 the emperor set on foot the Ostend East India Company, which was at once regarded as an offensive rival by the Amsterdam merchants. For the sake of crushing this competition the States in 1731 consented to guarantee the Pragmatic Sanction of Charles VI. In 1743 they joined England in supporting the claims of Maria Theresa, queen of Hungary, and fell consequently into complications with France, which invaded the barrier country. In 1744 they granted a subsidy in money and put 20,000 men in the field, and became a member of the Quadruple Alliance with Austria, England and Saxony. In 1745 the Provinces took their part in the rout of Fontenoy, after which Marshal Saxe overran the Austrian Netherlands, while England and Holland were alike paralyzed by the Jacobite rising in Scotland. The States lost every barrier-town, and lay defenseless before the French, who in 1747 entered Dutch Flanders, and made an easy

conquest. And now the Orange party, supported by English aid, began to lift its head. The Provinces had fallen so low that all men began to wish for a dictator. Accordingly Prince William Charles Henry Friso was proclaimed stadtholder, captain, and admiral-general of Zeeland at Terveer, under the title of William IV. The movement thus begun spread like wildfire; all Zeeland accepted him with enthusiasm, and Holland was not far behind; even at Amsterdam and the Hague the popular feeling was too strong to be resisted, and the government had to give way. William IV. became captain and admiral-general of the whole union, and stadtholder of the Seven Provinces: a little later these offices were declared hereditary in both male and female lines.

The peace of Aix-la-Chapelle, in 1748, though it nominally restored things to their old estate, could not efface the mischief and humiliation which the war had caused to Holland. Nor were affairs mended by the death of the stadtholder William IV. in 1751, who, though dull and quiet, did his best to develop the commercial and manufacturing prosperity of the States. His widow, Anne of England, daughter of George II., carried on the government for her son William V. She showed but little aptitude for the post of regent, and the Provinces had great difficulty in keeping clear of the European complications of the Seven Years' War. They did so, however, and after her death in 1759 were on better terms with England, which had urged them to take up the cause of Frederick the Great. In 1766 William V. was declared to be of age; irresponsible and weak, he was entirely under the command of his old preceptor Louis of Brunswick, and his wife Frederica Wilhelmina, niece of Frederick the Great. His rule is only distinguished for the springing up of several learned societies, and for the stimulus, derived partly from England partly from France, given to scientific inquiries. In other respects the influences of England and France were not propitious to the Provinces. In the American War of Independence William sympathized with the English court against the French and the revolted colonies, while the Dutch people warmly embraced the other side. Hence arose again old maritime disputes. The Provinces quarreled at home over the relative importance of army and navy, and strengthened neither. So things went on from 1776 to 1780, when the famous "Armed Neutrality," with which the Continental states replied to the demands of England on the seas, drew the provinces once more into the arena of European politics. After a division of the States, in which four were on one side and three on the other, the United Provinces decided to adopt the Neutrality, and threw in their lot with France and Russia against England. But though war broke out at once, nothing could cure the violence of party spirit—the stadtholder and the court party going with the English, and neutralizing all the warlike efforts of the "patriot" party. In 1781 Dutch commerce was utterly paralyzed; the other powers set on the Provinces, and took each its part. Their West India Islands were seized, and it seemed as if they could do nothing in their own defense. At last, however, an indecisive but not inglorious action with Admiral Parker at the Dogger Bank roused the national spirit, and the Orange party lost ground everywhere. In 1782 the Provinces recognized the independence of the United States of America; with generous sympathy the aged commonwealth saluted the rising republic of the West, which was destined to take its share also in the ruin of Dutch trade. In 1783 the States made an inglorious peace with England, in which the English got the right of free traffic with the Dutch East India colonies.

The patriot party was so much excited by this long series of blunders and humiliations that the fall of the house of Orange seemed imminent, and the king of Prussia had to interfere on behalf of his kinsfolk. In 1784 the States were in trouble with a new antagonist; the emperor Joseph II. sought to compel them to acquiesce in the reopening of the mouths of the Scheldt, so as to restore some of its ancient prosperity to Antwerp. But as neither party was able to fight, a peace was patched up in 1785, though its terms as usual were very humiliating to the States. The resistance against the princes of Orange continued to increase in violence, until in 1787 the Prussians again interfered, occupying Amsterdam, reinstating the stadtholder, who had been driven out, and compelling the States to ally themselves, much against their will, with England and Prussia.

Under their sway the Dutch passively remained, and when the French Revolution came they stood neutral as long as they could between it and the kings; it was not till Dumouriez had overrun all the Austrian Netherlands in 1792, and had determined to secure justice to Antwerp by forcing open the passage of the Scheldt, that they were drawn into the strife. On the death of Louis XVI. in 1793 the national convention at once declared war against both England and the Provinces. Their first campaign against the Dutch under Dumouriez failed; the invaders were arrested before Willemstadt, and ultimately were compelled to retreat. But in the autumn of 1793 Jourdan restored the credit of the French arms in the Austrian Netherlands. In 1794 Pichegru brilliantly completed the conquest of Belgium, and before the end of the year invaded the Provinces. The very severe frost of that winter gave his army easy passage over all the rivers and low-lying lands, which still formed the chief defense of the states; he occupied Amsterdam, and with his hussars crossed the ice and took the Dutch fleet as it lay at the Texel: the stadtholder fled (1795) to England; and the shattered remains of the duke of York's army having reached Bremen returned home in disgrace. The Republican party in the Provinces now reorganized the government so as to bring it into close harmony with that of Paris. A new constitution was framed; the ancient system of representative government, the stadtholderate, and the offices of captain and admiral-general were all swept away; a fair and open representation was established; and the Batavian republic came into being in close alliance with France. The French with one hand delivered the Provinces from a worn-out system of government, and with the other seized on a substantial return for their assistance. The new constitution, so excellent in appearance, soon proved a delusion. One change of government succeeded another, after the States-General came a national convention; then in 1798 a constituent assembly with an executive directory; then chambers of representatives; then a return to the earlier system under the names of the eight provincial and one central commissions (1801).

The peace of Amiens gave the country a little rest, and the Dutch got back the Cape of Good Hope and their South American colonies; it was, however, but the brief and deceptive lull between two storms; when war began again England once more swept away all she had restored. In 1805 Bonaparte, with his usual high hand, imposed on them a new constitution, and set Schimmelpenninck over them with the ancient title of grand pensionary. In the next year Napoleon added Holland to the ring of great fiefs with which he surrounded his imperial system, and forced an unwilling brother, Louis, to be king of an unwilling people. Worthy of a better fate, the excellent king of Holland did all in his power to protect his new subjects from the crushing friendship of his brother; but his efforts were

in vain, and he withdrew to Vienna. In 1810 Napoleon annexed all Holland to the empire, declaring that it was "in the nature of things nothing but a portion of France." In 1813 the change in the affairs of Europe encouraged the Dutch to join the general revolt, when they established a limited monarchy. The prince of Orange was recalled from England, and entered Amsterdam amidst the utmost enthusiasm. An assembly of notables met and declared him king with the title of William I., king of the Netherlands, in 1814. By the treaty of Paris Belgium was united to Holland, and the seventeen provinces were again forcibly joined together under one prince. It was settled that the house of Orange should have the hereditary sovereignty, with a fairly liberal constitution. To make up to the new king for the loss of his territories in Germany, the grand duchy of Luxembourg, with the exception of the town and fortress of Luxembourg, was handed over to him as his private possession, not as a part of the kingdom; the bishopric of Liège and the duchy of Bouillon also went with it. The episode of the "Hundred Days," though it delayed the conclusion of the very complicated arrangements involved in these transfers, gave the new kingdom an opportunity of distinguishing itself: it was the first point of attack, and met the crisis with vigor. The Dutch troops under William, eldest son of the new king, took considerable part in the short and striking campaign which was closed on June 18, 1815, by the final victory of Waterloo.

The allied powers now founded in Holland and Belgium what they hoped would be a solid and permanent kingdom as a barrier against France. It was felt that Napoleon had shown Europe the importance of this district in connection with this scheme for European domination. The new kingdom under the house of Orange was therefore the subject of great and anxious consideration at Vienna. The king, an hereditary sovereign, received full executive powers, and the initiative in proposing laws. He had also the power of appointing his own council of state. As a legislative body there were the States-General, divided into two chambers, each province had also its own local states. Freedom of worship and political equality were secured for all.

A highly artificial arrangement like this, however, could not stand long, if Europe came to throw off the trammels of the monarchical reaction, and to give freer course to those liberal tendencies which had survived the drama of the French Revolution. In religious belief, in laws and usages, in language, in interests, the Belgic and Batavian provinces had little in common. Their inhabitants were different races, with instincts and feelings not merely diverse but opposed. The Belgic provinces spoke French or Walloon; the Batavians, Dutch. The Belgians were strict Catholics, while the Dutch were Protestants. The Dutch were chiefly a commercial and seafaring people, with interests in distant lands and colonial possessions; the Belgians were agriculturists, except where their abundance of minerals made them manufacturers. The Dutch connected themselves with Germany and (though often only by way of rivalry) with England; the Belgians drew their chief inspirations from France, and connected themselves with the French in traditions, religion and commercial interests. Such a diversity could not possibly stand the brunt of any great political movement; especially as the Dutch were oppressive toward their Belgian partners in the kingdom. Accordingly we find that in 1830 the revolution at Paris at once aroused the strongest sympathy at Brussels. The dull obstinacy of William I. had emphasized the divergence, and his narrow and antiquated policy rendered an outburst inevitable.

The revolt at Brussels, which began on August 25, 1830, spread instantly throughout the whole of Belgium. After a short struggle in November, a conference of France, England, Prussia, Austria and Russia, sitting in London at the request of William I., proposed an armistice, to which both parties agreed. In the following January the conference attempted to settle the terms of a separation, and proposed that Holland should have Luxembourg and part of the left bank of the Scheldt; this the Dutch accepted, while the provisional government at Brussels protested against it. The assembly at Brussels constructed a new and liberal constitution, with a broad representative government, liberty of teaching, of the press, of public meeting; and in April, 1831, the crown was offered to Leopold of Saxe-Coburg, who, after ascertaining that he would be recognized by England and France, did not hesitate to accept it (see BELGIUM). This appointment caused the utmost irritation at the Hague, and the Dutch suddenly invaded Belgium; the opportune appearance of a French army checked the Dutch advance, and gave diplomacy time to interfere. The citadel of Antwerp, however, was still in Dutch hands, and the allied powers used in vain all their influence to persuade William I. to give it up to the Belgians. War was hereon declared, and France and England blockaded the Dutch ports, while a French army attacked the citadel, and, after a sharp struggle compelled it to capitulate. The forts of Lillo and Liefkenshoek were left in the hands of the Dutch; on May 21, 1833, there was signed at London by the plenipotentiaries of Holland on one side and those of England and France on the other, a convention in which William I. engaged not to recommence hostilities against Belgium, and to leave the Scheldt navigation open, till the relations between the two countries should be definitely settled by treaty. The final settlement of outstanding questions, however, was not reached till six years later, when Limburg and the eastern part of Luxembourg were secured to Holland, and heavy tolls were imposed on the navigation of the Scheldt; then the two kingdoms finally parted company on April 19, 1839.

In the following year William I. resigned his crown to his son William II., who reigned in peace till his death in 1849, when he was succeeded by his eldest son William III., who still reigns. The wave of revolution which passed over Europe in 1848 had in Holland comparatively little effect; the constitution of 1814 was revised, and the tranquillity of the country secured. In 1853, after the establishment by the papacy of Catholic bishoprics in England and Holland, a considerable excitement arose, which resulted in the accession to power of a moderate, liberal, and entirely Protestant cabinet, and in the main the Protestant-liberal party has guided the country for the last quarter of a century. The Dutch took but a secondary part in the disputes between France and Germany as to Dutch Luxembourg. The present ruler of Holland is Queen Wilhelmina, born 1880; succeeded 1890; inaugurated 1898.

HOLLAND, or HOLLAND AND WEST FRIESLAND, was the second province of the republic of the United Netherlands, and consisted of the old county of Holland, with the addition of the lordship of Voorne. In 1801, after the erection of the Batavian republic, very nearly the same area was included in the "department" of Holland; but when, in June, 1806, Holland became the name of the new kingdom, it ceased to be applied to any of the administrative divisions. On the establishment of the kingdom of the Netherlands in 1814 the province of Holland was restored, with its ancient limits only slightly modified. A few further alterations were made

ic. 1815, 1819, and 1820. It was the only province that had two governors, one for the north and another for the south, and the provincial states met alternately at the Hague and at Haarlem. In 1840 this bipartite arrangement was carried to its logical conclusion by the erection of two distinct provinces called respectively North and South Holland. Pop. of both (1901), 2,155,263.

HOLLAND, SIR HENRY, physician and author, was born at Knutsford, Eng., October 27, 1788.

He was the author of *General View of the Agriculture of Cheshire*, 1807; *Travels in the Ionian Isles, Albania, Thessaly, and Greece*, 1812-13, 2d ed., 1819; *Medical Notes and Reflections*, 1839; *Chapters on Mental Physiology*, 1852; *Essays on Scientific and Other Subjects contributed to the Edinburgh and Quarterly Reviews*, 1862; and *Recollections of Past Life*, 1872, which is less interesting than it might have been, owing to the reticence of the author in regard to personal details and characteristics. He died in 1873.

HOLLAND, PHILEMON, usually styled, in the words of Thomas Fuller, "the translator-general of his age," was born in 1551 at Chelmsford, England, and died in 1636.

HOLLAND, HENRY RICHARD VASSALL FOX, THIRD BARON, nephew of Charles James Fox, and only son of Stephen Fox, second Lord Holland, was born at Winterslow House, Wiltshire, November 21, 1773.

Lord Holland's early inheritance of a peerage must be regarded rather as a misfortune than an advantage, for it debarred him from a career in the House of Commons which might have proved as brilliant as that of his uncle Charles Fox, and raised him to an assembly, not only more listless and much less numerous, but where, at the time he entered it, the Whig party, of whose principles the influence of his uncle had induced him to become a strenuous supporter, could muster only a minority of six or seven in a house of eighty or ninety. He began his political career by a motion against the Assessed Tax Bill, and though his speech had, as was to be expected, no influence on the division, it proved that he had inherited the oratorical abilities of his family, and pointed him out as the leader of his uncle's supporters in the Upper House. As his disapproval of most of the proceedings of the House of Lords was recorded by protests, his copiousness in this species of composition has perhaps never been equaled. These protests were afterward collected and published by D. C. Moylan under the title *The Opinions of Lord Holland as recorded in the Journals of the House of Lords, from 1797 to 1841* (London, 1841), and, besides constituting, as they necessarily do, a full though condensed account of his political views and opinions, form one of the most authentic and original records of the course of Whig policy during the years to which they refer. After the peace of Amiens in 1802 Lord Holland proceeded to Paris, whence he went to Spain, staying in that country until the declaration of war in January, 1805, when he returned to England. Of this second visit to Spain he doubtless took advantage for the purpose of acquiring a more complete mastery of the Spanish language and literature, and the fruit of this was seen in the publication, in 1807, of *The Life and Writings of Lope Felix de Vega Carpio*, and in 1808 of *Three Comedies from the Spanish*. When the ministry of "All the Talents" came into office in 1806, Lord Holland was made a privy counselor, and was appointed, along with Lord Auckland, to negotiate with the American plenipotentiaries that treaty the refusal of whose ratification by Mr. Jefferson resulted in the subsequent war with America. On the death of Mr. Fox, October 15th, following, Lord Holland received the privy seal, holding office till the dismissal of

the ministry in 1807. When the Spaniards rebelled against the French yoke in 1808, Lord Holland's interest in the country induced him to pay it a third visit. He landed at Corunna almost simultaneously with the division of the British army under Sir David Baird, and did not return to England till the close of 1809. During the long period when the Whigs were excluded from power, Lord Holland continued to afford them his strenuous and steady support. He did not join the Canning ministry of 1827, but when the Whigs were recalled in 1830, he became chancellor of the duchy of Lancaster, an office which, with the exception of two short intervals when his party were temporarily excluded from power, he continued to hold till his death at Holland House, October 22, 1840.

HOLLAR, WENZEL, or **WENCESLAUS**, a celebrated etcher, was born at Prague on July 13, 1607, and died at Westminster, being buried at St. Margaret's church on March 28, 1677.

HOLLY, *Ilex*, L., a genus of trees and shrubs, of the natural order *Ericaceae Aquifoliaceae*, containing some one hundred and fifty species, of which several occur in the temperate northern hemisphere, Northwest America excepted, by far the larger number in tropical Asia and America, and very few in Africa and Australia.

The wood of the holly is even-grained and hard, especially when from the heartwood of large trees, and almost as white as ivory, except near the center of old trunks, where it is brownish. It is employed in inlaying and turning, and, since it stains well, in the place of ebony, as for teapots and handles. For engraving it is inferior to box. When dry it weighs about 47½ pounds per cubic foot. From the bark of the holly birdlime is manufactured. From the leaves are obtainable a coloring matter named *ilixanthin*, *ilicic acid*, and a bitter principle, *ilicin*, which has been variously described by different analytical chemists. The leaves have been used in rheumatism, and were at one time, on account of their bitter taste, supposed to be of value in intermittent fever. A. Lonicerus speaks of their decoction as a remedy for pain in the side. They are eaten by sheep and deer, and in parts of France serve as a winter fodder for cattle. The berries provoke in man violent emesis and catharsis, but are eaten with immunity by thrushes and other birds. The custom of employing holly and other plants for decorative purposes at Christmas is one of considerable antiquity, and has been regarded as a survival of the usages of the Roman Saturnalia, or of an old Teutonic practice of hanging the interior of dwellings with evergreens as a refuge for sylvan spirits from the inclemency of the weather.

HOLLYHOCK, *Althæa rosea*, L., a perennial plant of the natural order *Malvaceae* and tribe *Malvæe*, a native of the East, has been cultivated in Great Britain for about three centuries. The ordinary hollyhock is single-blossomed, but the florists' varieties have all double flowers, of white, yellow, rose, purple, violet, and other tints, some being almost black. The plant is in its prime about August, but by careful management examples may be obtained in blossom from July to as late as November. Hollyhocks are propagated from seed, or from division of the root or by planting out in rich sandy soil, in a close frame, with a gentle bottom heat, single eyes from woodshoots, or cuttings from outgrowths of the old stock or of the lateral offsets of the spike. The seed may be sown in October under cover, the plants obtained being potted in November, and kept under glass till the following April, or, if it be late-gathered, in May or June, in the open ground, whence, if required, the plants are best removed in October or April.

HOLMAN, JAMES, the "Blind Traveler," was born

about 1787. He entered the British navy in 1798 as first-class volunteer, and was appointed lieutenant in April, 1807. In 1810 he was invalided by an illness which resulted in the total and hopeless deprivation of sight. In consideration of his helpless circumstances, he was in 1812 appointed one of the royal knights of Windsor, but the dullness and seclusion of such a life harmonized so ill with his active habits and keen interest in the outside world, that he requested leave of absence that he might go abroad. This being granted, he, in 1819, 1820, and 1821, journeyed through France, Italy, Switzerland, the parts of Germany bordering on the Rhine, Belgium, and the Netherlands. In 1822 he published a narrative of his journey. He published in four volumes in 1824-35, under the title of *A Voyage round the World, including Travels in Africa, Asia, Australasia, America, etc., from 1827 to 1832*, an account of his extensive travels. His last journeys were through Spain, Portugal, Wallachia, Moldavia, Montenegro, Syria, and Turkey; and he was engaged in preparing his journals of this tour for the press when he died at London, July 29, 1857.

HOLSTEIN. See SCHLESWIG-HOLSTEIN.

HOLT, SIR JOHN (1642-1710), lord chief-justice of the court of King's Bench in the reigns of William III. and Anne, was born at Thame, Oxfordshire, December 30, 1642. In February, 1666, he was appointed recorder of London, and on the 22d of April he was made king's sergeant, and received the honor of knighthood. Having been one of the judges who acted as assessors to the peers in the Convention parliament, he took a leading part in arranging the constitutional change by which William III. was called to the throne, and after his accession he was appointed lord chief-justice of the king's bench. His merits as a judge are the more apparent and the more remarkable when contrasted with the qualities displayed by his unworthy predecessors in office. In judicial fairness, legal knowledge and ability, clearness of statement, and unbending integrity, he has had few if any superiors on the English bench. While steadfast in his sympathies with the Whig party, Holt maintained on the bench entire political impartiality, and always held himself aloof from political intrigue. On the retirement of Somers from the chancellorship in 1700 he was offered the great seal, but declined it. His death took place March 3, 1710, and he was buried in the chancel of Redgrave church, where a fine monument in white marble was erected by his brother to his memory.

HÖLTY, LUDWIG HEINRICH CHRISTOPH, German poet, and one of the founders of the "Hainbund," was born at Mariensee in Hanover, December 21, 1748, and died in 1776.

HOLYHEAD, a market-town and parliamentary borough of Anglesey, North Wales, is situated on a small island on the western extremity of the county and at the terminus of the Chester and Holyhead Railway, about four miles from Bangor. Population, 10,000.

HOLY ISLAND, or LINDISFARNE, an irregularly shaped island in the North Sea, ten miles south-southeast of Berwick, and two miles from the coast of Northumberland, in which county it is included. It is joined to the mainland at low water by flat sands, over which a track, marked by wooden posts and practicable for vehicles, leads to the island.

HOLYOKE, a Massachusetts city, is situated in a curve of the Connecticut river, in Hampden county, on the west bank of the stream, about 105 miles west of Boston. The town lies upon the slope of a hill, and is well laid out, and contains some handsome buildings, the most notable public structure being the granite city hall. There are numerous churches, the principal de-

nominations being represented—the Roman Catholics, among others, having, beside their houses of worship, several convents, a home for girls, and an orphanage. The town is fully abreast with the times, having several newspapers, a full quota of national and other banks, and all the improvements and appliances of modern city life. Its municipal government is well administered, and its water, fire, and police departments are efficient and well organized. The streets are well lighted, and the board of public works attentive to their duties and responsibilities. The commercial interests of the city are considerable, and are constantly increasing. But Holyoke is a manufacturing city *par excellence*. The river is crossed here by a dam, which furnishes motive power for a large number of manufactories, which include in their productions an almost endless variety of goods. The city is the seat of extensive paper-making industries, so large as to make its claim of being the largest producer of that article in the world, perhaps justifiable. Cotton, woolen, and silk goods are also made in large quantities, while iron, steel, screws, lumber, sash, doors, and blinds, together with flour, mechanics' tools, files, cutlery, etc., go to make up industries in which a large capital and many operatives are employed. The school facilities of the city are unexcelled, the excellent common-school system being supplemented by the Roman Catholic parish schools. There is an excellent public library in the city. The city has some fishery interests, a large number of shad being seined in season. On the opposite side of the river is the town of South Hadley, with which it is connected by bridge. The city is surrounded by low mountains, or rather high ridges, the principal elevations of which are Mount Holyoke and Mount Tom. Several railroads center here, giving communication with all sections of the continent; and various telegraph lines connect it with the business centers of the country. The growth of the city is steady, both in population and wealth, the number of inhabitants being in 1900 (U. S. census) 45,712.

HOLY WATER, in Roman Catholic ritual, is a specially exorcised and consecrated mixture of salt and water, believed to possess, when duly sprinkled, peculiar potency as a remedy for sickness, mental or bodily, and as a protection to property. According to present usage prescribed in the *Missal*, it is prepared in the sacristy on Sunday by the priest who is to celebrate high mass (or by some other on whom the duty is devolved): robed in alb and superpelliceum and wearing his stole, he first exorcises the salt and water separately; next he mixes the two in the name of Father, Son and Holy Ghost; and finally he pronounces the prayer of consecration over the mixture. Thereupon he assumes his pluvial, goes to the altar, and takes from the deacon the aspergillum, with which he sprinkles the altar, himself, his assistants, and the congregation, meanwhile repeating the words of Ps. li. 7. The faithful who desire it are afterward permitted to carry a supply home with them for application to the sick and for similar purposes. Holy water is solemnly used, not only in the consecration of sacred objects, such as churches, churchyards, bells, images, vestments, and the like, but also on various domestic occasions such as marriages and funerals.

HOLY WEEK, in the ecclesiastical year the week immediately preceding that of Easter. The earliest allusion to the custom of marking this week as a whole with special observances is to be found in the *Apostolical Constitutions* (v. 18, 19), dating from the latter half of the third century A.D. Abstinence from wine and flesh is there commanded for all the days, while for the Friday and Saturday an absolute fast is enjoined.

HOLYWELL (Welsh, *Treffynnon*, the town of the well), a parliamentary borough and market-town of Flintshire, North Wales, is beautifully situated on an eminence near the left bank of the estuary of the Dee, and about two miles from the station on the Chester and Holyhead line. Population 9,000.

HOLZMINDEN, the chief town of a circle in the duchy of Brunswick, Germany, is situated on the right bank of the Weser, at the foot of the Sollinger mountains, and on the railway from Kreinsen to Altenbeken. Population about 8,500.

HOMAGE (from *homo*, through the Low Latin *hominaticum*, which occurs in a document of 1035) was one of the ceremonies used in the granting of the fief, and indicated the submission of a vassal to his lord. It could be received only by the suzerain in person. With head uncovered the vassal humbly requested to be allowed to enter into the feudal relation; he then laid aside his sword and spurs, ungirt his belt, and kneeling before his lord uttered words to this effect: "I become your man from this day forth, of life and limb, and will hold faith to you for the lands I claim to hold of you." The oath of fealty, which could be received by proxy, followed the act of homage; then came the ceremony of investiture, either directly on the ground or by the delivery of a turf, a handful of earth, a stone, or some other symbolic object. Homage was done not only by the vassal to whom feudal lands were first granted but by everyone in turn by whom they were inherited, since they were not granted absolutely but only on condition of military and other service. An infant might do homage, but he did not thus enter into full possession of his lands.

HOMBERG, WILHELM, an eminent natural philosopher, born at Batavia, January 8, 1652, was educated in Holland, studied law at Jena and Leipsic, and became an advocate at Magdeburg in 1674. At Paris, whither he repaired in 1691, he was elected a member of the Academy of Sciences, and became (1702) teacher of physics and (1705) private physician to the duke of Orleans. He died at Paris, September 24, 1715.

HOMBURG-VOR-DER-HÖHE, chief town of the circle of Obertaunus in the Wiesbaden government district of the Prussian province of Hesse-Nassau, is prettily situated on a small stream at the foot of a spur of the Taunus mountains, about eleven miles north of Frankfurt-on-the-Main, with which it is connected by rail.

Homburg first came into repute as a watering-place in 1834, and owing to its gambling-tables, which were set up soon after, it rapidly became one of the favorite and most fashionable health-resorts of the Continent. In 1849 the town was occupied by Austrian troops for the purpose of enforcing the imperial decree against gambling establishments, but immediately on their withdrawal the bank was again opened, and play continued unchecked till 1872, when the Prussian Government refused to renew the lease for gambling purposes which then expired. As the capital of the former landgraviate of Hesse-Homburg the town shared the vicissitudes of that State. Population (1901), about 12,500.

HOME, HENRY. See **KAMES, LORD**.

HOME, JOHN, Scottish dramatic poet, was born September 20, 1722, and died in 1808.

HOMEL, or **GOMOL**, a town of Russia, in Europe, in the government of Mohileff, 132 miles south of Mohileff, on the highway to Tchernigoff, and on the right bank of the Sosh, which joins the Dnieper about forty-five miles farther down. Population, 13,000.

HOMER (*Ὅμηρος*) was by the general consent of antiquity the first and greatest of poets. Many of the works once attributed to him are lost; those which re-

main are the two great epics the *Iliad* and the *Odyssey*, about thirty *Hymns*, a mock epic (the *Battle of the Frogs and Mice*), and some pieces of a few lines each (the so-called *Epigrams*).

Ancient Accounts of Homer.—Of the date of Homer probably no record, real or pretended, ever existed. Herodotus maintains that Hesiod and Homer lived not more than 400 years before his own time, consequently not much before 850 B.C. From the controversial tone in which he expresses himself it is evident that others had made Homer more ancient; and accordingly the dates given by later authorities, though very various, generally fall within the tenth and eleventh centuries B.C.

The extant lives of Homer are eight in number, including the piece called the *Contest of Hesiod and Homer*. The longest is written in the Ionic dialect, and bears the name of Herodotus, but is certainly spurious. The other lives are probably not more ancient. They contain a strange medley, ranging from the simplest outgrowth of popular fancy to the frigid inventions of the age which would not confess itself ignorant of the name of Hecuba's mother. Thus the story that Homer was the son of the Meles (the river on which Smyrna is situated) and the nymph Critheis is evidently a local legend. Another story of a primitive cast describes the manner of Homer's death in the Island of Ios. Seeing some young fishermen on the beach with their nets, he asked them—

"Fishermen sprung of Arcadia, have we aught?"

To which they answered in a riddle—

"What we caught we left behind,
What we caught not we bear with us."

Homer could not explain this, and then he remembered an oracle which had told him to beware of the young men's riddle. He wrote an epitaph for himself, and died on the third day after. This story comes from a lost work of Aristotle. On the other hand, when we are told in the Herodotean life that Critheis was a daughter of Melanopus, one of the colonists who came to Cyme from Magnesia, that being found to be with child she was sent with the fresh colony that founded Smyrna, that she there brought forth Homer on the banks of the Meles, whence he was called Melesigenes,—in this form of the story it is easy to recognize the hand of the critic. There is an evident desire to get rid of the primitive supernatural element, and also to reconcile the claims of two cities, Cyme and Smyrna, to the envied distinction of giving birth to Homer. There are other incidents in the Herodotean life which seem devised merely to fit certain of the minor characters in the Homeric poems. Phemius, we are told, was a schoolmaster of Smyrna, who was kind to the young Melesigenes, and was accordingly immortalized as the singer in the *Odyssey*; the original of Mentor was a man of Ithaca, who entertained Homer and tended him in illness; and so on.

The chief value of these "Lives," and especially of the Herodotean life, lies in the curious short poems which they have preserved. These poems are the *Epigrams* which used to be printed at the end of Homer, but are banished by the somewhat inconvenient purism of modern editors.

It is plain that the contention for the honor of being the birthplace of Homer began at a time when his real history had been lost. And since the inevitable legend found no clue in the *Iliad* and *Odyssey*, it was driven to seek for one in poems of secondary value.

Time and Place of Homer.—The oldest direct references to the *Iliad* and *Odyssey* are in Herodotus, who

quotes from both poems. The quotation from the *Iliad* is of interest because it is made in order to show that Homer supported the story of the travels of Paris to Egypt and Sidon (whereas the Cyclic poem called the *Cypria* ignored them), and also because the part of the *Iliad* from which it comes is cited as the "Aristeia of Diomedes." This was therefore a recognized part of the poem.

The earliest mention of the name of Homer is found in a fragment of the philosopher Xenophanes (of the sixth century B.C.) The passage shows, not merely that Homer was well known at Colophon in the time of Xenophanes, but also that the great advance in moral and religious ideas which forced Plato to banish Homer from his republic had made itself felt in the days of the early Ionic philosophers.

Failing external testimony, the time and place of the Homeric poems can only be determined (if at all) by internal evidence. This is of two main kinds: (1) evidence of history, consisting in a comparison of the political and social condition, the geography, the institutions, the manners, arts, and ideas of Homer with those of other times; (2) evidence of language, consisting in a comparison with later dialects, in respect of grammar and vocabulary. To these may be added, as occasionally of value, (3) evidence of the direct influence of Homer upon the subsequent course of literature and art.

Structure of the Iliad.—The subject of the *Iliad*, as the first line proclaims, is the "anger of Achilles." The manner in which this subject is worked out will appear from the following summary, in which we distinguish (1) the plot, *i. e.*, the story of the quarrel, (2) the main course of the war, which forms a sort of underplot, and (3) subordinate episodes.

- I. Quarrel of Achilles with Agamemnon and the Greek army—Agamemnon, having been compelled to give up his prize, Chryseis, takes Briseis from Achilles—Thereupon Achilles appeals to his mother Thetis, who obtains from Zeus a promise that he will give victory to the Trojans until the Greeks pay due honor to her son—Meanwhile Achilles takes no part in the war.
- II. Agamemnon is persuaded by a dream sent from Zeus to take the field with all his forces. His attempt to test the temper of the army nearly leads to their return. Catalogue of the army.
- III. Trojan muster—Trojan catalogue. Meeting of the armies—Paris challenges Menelaus—Truce made. "Teichoscopy," Helen pointing out to Priam the Greek leaders.
- IV. The duel—Paris is saved by Aphrodite. Truce broken by Pandarus. Advance of the armies—Battle.
- V. Aristeia of Diomedes—his combat with Aphrodite—Meeting with Glaucus—Visit of Hector to the city, and offering of a peplos to Athene.
- VI. (1-311) Visit of Hector to Paris—to Andromache.
- VII. Return of Hector and Paris to the field. Duel of Ajax and Hector. Truce for burial of dead.
- VIII. The Greeks build a wall round their camp. Battle—The Trojans encamp on the field.
- IX. Agamemnon sends an embassy by night, offering Achilles restitution and full amends—Achilles refuses.
- X. Doloneia—Night expedition of Odysseus and Diomedes.
- XI. Aristeia of Agamemnon—he is wounded—Wounding of Diomedes and Odysseus.
- XII. Achilles sends Antilochus to inquire about Machaon. Storming of the wall—the Trojans reach the ships.
- XIII. Zeus ceases to watch the field—Poseidon secretly comes to the aid of the Greeks.
- XIV. Sleep of Zeus by the contrivance of Hera.
- XV. Zeus awakened—Restores the advantage to the Trojans—Ajax alone defends the ships.

- XVI. Achilles is persuaded to allow Patroclus to take the field. Patroclus drives back the Trojans—kills Sarpedon—is himself killed by Hector.
- XVII. Battle for the body of Patroclus—Aristeia of Menelaus.
- XVIII. News of the death of Patroclus is brought to Achilles—Thetis comes with the Nereids—promises to obtain new armor for him from Hephaestus. The shield of Achilles described.
- XIX. Reconciliation of Achilles—His grief and desire to avenge Patroclus.
- XX. The gods come down to the plain—Combat of Achilles with Aeneas and Hector, who escape.
- XXI. The Scamander is choked with slain—rises against Achilles, who is saved by Hephaestus.
- XXII. Hector alone stands against Achilles—his flight round the walls—he is slain.
- XXIII. Burial of Patroclus—Funeral games.
- XXIV. Priam ransoms the body of Hector—his burial.

A recent writer (Dr. E. Kammer) has given some strong reasons for doubting the genuineness of the passage in book xx. describing the duel between Achilles and Aeneas (79-352). The incident is certainly very much out of keeping with the vehement action of that part of the poem, and especially with the moment when Achilles returns to the field, eager to meet Hector and avenge the death of his friend. The interpolation (if it is one) is probably due to local interests. It contains the well-known prophecy that the descendants of Aeneas are to rule over the Trojans—pointing to the existence of an Aenead dynasty in the Troad. So, too, the legend of Anchises in the Hymn to Aphrodite is evidently local; and Aeneas becomes more prominent in the later epics.

Structure of the Odyssey.—In the *Odyssey*, as in the *Iliad*, the events related fall within a short space of time. The difficulty of adapting the long wanderings of Ulysses to a plan of this type is got over by the device—first met with in the *Odyssey*—of making the hero tell the story of his own adventures. In this way the action is made to begin almost immediately before the actual return of Ulysses. Up to the time when he reaches Ithaca it moves on three distinct scenes: we follow the fortunes of Ulysses, of Telemachus on his voyage in the Peloponnesus, and of Penelope with the suitors. The art with which these threads are woven together was recognized by Wolf himself, who admitted the difficulty of applying his theory to the "admirabilis summa et compages" of the poem. Of the comparatively few attempts which have been made to dissect the *Odyssey*, the most moderate and attractive is that of Professor A. Kirchoff of Berlin.

Chorizontes.—When we are satisfied that each of the great Homeric poems is either wholly or mainly the work of a single poet, a question remains which has been matter of controversy in ancient as well as modern times—Are they the work of the same poet? Two ancient grammarians, Xeno and Hellanicus, were known as the separators (*οἱ χωρίζοντες*); and Aristarchus appears to have written a treatise against their heresy. In modern times some of the greatest names have been on the side of the "Chorizontes."

If, as has been maintained in the preceding pages, the external evidence regarding Homer is of no value, the problem now before us may be stated in this form: Given two poems of which nothing is known except that they are of the same school of poetry, what is the probability that they are by the same author? We may find a fair parallel by imagining two plays drawn at hazard from the works of the great tragic writers. It is evident that the burden of proof would rest with those who held them to be by the same hand.

The arguments used in this discussion have been of very

various caliber. The ancient Chorizontes observed that the messenger of Zeus is Iris in the *Iliad*, but Hermes in the *Odyssey*; that the wife of Hephaestus is one of the Charities in the *Iliad*, but Aphrodite in the *Odyssey*; that the heroes in the *Iliad* do not eat fish; that Crète has a hundred cities according to the *Iliad*, and only ninety according to the *Odyssey*; that *πρωταρχος* is used in the *Iliad* of place, in the *Odyssey* of time, etc. Modern scholars have added to the list, especially by making careful comparisons of the two poems in respect of vocabulary and grammatical forms. Nothing is more difficult than to assign the degree of weight to be given to such facts. The difference of subject between the two poems is so great that it leads to the most striking differences of detail, especially in the vocabulary.

The *Iliad* is much more historical in tone and character. The scene of the poem is a real place, and the poet sings (as Ulysses says of Demodocus) as though he had been present himself, or had heard from one who had been. The supernatural element is confined to an interference of gods, which to the common eye hardly disturbs the natural current of affairs. The *Odyssey*, on the contrary, is full of the magical and romantic,—"speciosa miracula," as Horace calls them. Moreover, these marvels—which in their original form are doubtless as old as anything in the *Iliad*, since in fact they are part of the vast stock of popular tales (*Märchen*) diffused all over the world—are mixed up in the *Odyssey* with the heroes of the Trojan war. This has been especially noticed in the case of the story of Polyphemus, one that is found in many countries, and in versions which cannot all be derived from Homer. W. Grimm has pointed out that the behavior of Ulysses in that story is senseless and foolhardy, utterly beneath the wise and much-enduring Ulysses of the Trojan war. The reason is simple; he is not the same Ulysses, but a being of the same world as Polyphemus himself—the world of giants and ogres. The question, then, is—how long must the name of Ulysses have been familiar in the legend (*Sage*) of Troy before it made its way into the tales of giants and ogres (*Märchen*), where the poet of the *Odyssey* found it?

Again, the Trojan legend has itself received some extension between the time of the *Iliad* and that of the *Odyssey*. The story of the Wooden Horse is not only unknown to the *Iliad*, but is of a kind which we can hardly imagine the poet of the *Iliad* admitting. The part taken by Neoptolemus seems also to be a later addition. The tendency to amplify and complete the story shows itself still more in the Cyclic poets. Between the *Iliad* and these poets the *Odyssey* often occupies an intermediate position.

This great and significant change in the treatment of the heroic legends is accompanied by numerous minor differences (such as the ancients remarked) in belief, in manners and institutions, and in language. These differences bear out the inference that the *Odyssey* is of a later age. The progress of reflexion is especially shown in the higher ideas entertained regarding the gods. The turbulent Olympian court has almost disappeared. Zeus has acquired the character of a supreme moral ruler; and although Athene and Poseidon are adverse influences in the poem, the notion of a direct contest between them is scrupulously avoided. In matters bearing upon the arts of life it is unsafe to press the silence of the *Iliad*. We may note, however, the difference between the house of Priam, surrounded by distinct dwellings for his many sons and daughters, and the houses of Ulysses and Alcinoüs, with many chambers under a single roof. The singer, too, who is so prominent a figure in the *Odyssey* can hardly be thought to

be absent from the *Iliad* merely because the scene is laid in a camp.

Style of Homer.—A few words remain to be said on the style and general character of the Homeric poems, and on the comparisons which may be made between Homer and analogous poetry in other countries.

The cardinal qualities of the style of Homer have been pointed out once for all by Mr. Matthew Arnold. "The translator of Homer," he says, "should above all be penetrated by a sense of four qualities of his author—that he is eminently rapid; that he is eminently plain and direct, both in the evolution of his thought and in the expression of it, that is, both in his syntax and in his words; that he is eminently plain and direct in the substance of his thought, that is, in his matter and ideas; and, finally, that he is eminently noble."

The peculiar rapidity of Homer is due in great measure to his use of the hexameter verse. It is characteristic of early literature that the evolution of the thought—that is, the grammatical form of the sentence—is guided by the structure of the verse; and the correspondence which consequently obtains between the rhythm and the grammar—the thought being given out in lengths, as it were, and these again divided by tolerably uniform pauses—produces a swift flowing movement, such as is rarely found when the periods have been constructed without direct reference to the meter. That Homer possesses this rapidity without falling into the corresponding faults—that is, without becoming either "jerky" or monotonous—is perhaps the best proof of his unequalled poetical skill. The plainness and directness, both of thought and expression, which characterize Homer were doubtless qualities of his age; but the author of the *Iliad* (like Voltaire, to whom Mr. Arnold happily compares him) must have possessed the national gift in a surpassing degree. The *Odyssey* is in this respect perceptibly below the level of the *Iliad*.

Rapidity or ease of movement, plainness of expression, and plainness of thought, these are not the distinguishing qualities of the great epic poets—Virgil, Dante, Milton. On the contrary, they belong rather to the humbler epico-lyrical school for which Homer has been so often claimed. The proof that Homer does not belong to that school—that his poetry is not in any true sense "ballad poetry"—is furnished by the higher artistic structure of his poems (already discussed), and as regards style by the fourth of the qualities distinguished by Mr. Arnold—the quality of *nobleness*. It is his noble and powerful style, sustained through every change of idea and subject, that finally separates Homer from all forms of "ballad poetry" and "popular epic."

But while we are on our guard against a once common error, we may recognize the historical connection between the *Iliad* and *Odyssey* and the "ballad" literature which undoubtedly preceded them in Greece. It may even be admitted that the swift-flowing movement, and the simplicity of thought and style, which we admire in the *Iliad* are an inheritance from the earlier "lays"—the *ᾠδαὶ ἀνδρῶν* such as Achilles and Patroclus sang to the lyre in their tent. Even the meter—the hexameter verse—may be assigned to them. But between these lays and Homer we must place the cultivation of epic poetry as an art. The pre-Homeric lays doubtless furnished the elements of such a poetry—the alphabet, so to speak, of the art; but they must have been refined and transmuted before they formed poems like the *Iliad* and *Odyssey*.

HOMESTEAD, a railroad, telegraph, and banking town of Alleghany county, Penn., lies about eight miles from Pittsburg. It is a suburban residence for some of the Pittsburg business men, and is growing steadily. Population (1900), 12,554.

HOMESTEAD LAWS. Under the laws of the United States, as embodied in the acts of May 20, 1862, March 3, 1879, and May 6, 1886, any citizen who is twenty-one years of age or who is the head of a family may select from any of the surveyed and otherwise unappropriated public lands of the United States a homestead of 160 acres free of cost except entry fees. The law provides that the homestead shall be exempt from execution and from alienation by the householder. In order to obtain a homestead the applicant must make affidavit before a register and receiver of the land office that he is over twenty-one years of age, or is the head of a family, that he is a citizen of the United States or has declared in good faith his intention to become a citizen, and that he makes the entry for his exclusive use and benefit, and for actual settlement and cultivation. He must select a tract of land of agricultural character, located in a compact body, and upon which no one has a previous claim. The law requires that the homesteader must reside continuously upon his claim for five years, must cultivate it and make certain improvements upon it. Abandonment of the land or absence from it for a period of more than six months renders the entry liable to cancellation. The original entry gives the settler a "claim" only, and he acquires no title which he can convey until after he has made his "final proof." This consists in the affidavit of the settler and two witnesses that he has made actual settlement upon and has cultivated the land for five years, and that he is a citizen and has never perfected or abandoned an entry made under the homestead law. The land office then issues a patent and the settler acquires a permanent and absolute title to his homestead. Soldiers and sailors of the War of the Rebellion, who served ninety days or more in the Union army or navy may count their term of service (not exceeding four years) as residence upon the land, but they cannot perfect title without at least one year's continuous residence upon the land. There are also provisions for "additional entry," where the original entry was less than 160 acres, but the additional entry must be upon lands adjoining the original lands, or the settler may surrender his original entry and make another of full size. Soldiers and sailors who, prior to June 22, 1874, made homestead entries of less than 160 acres, may select their additional entries from any unoccupied lands.

Under the preëmption laws 160 acres (only eighty acres in some States) can be obtained by actual settlers on payment of \$1.25 per acre for the "minimum" lands, or \$2.50 per acre for the "double minimum" lands. The latter are lands where alternate sections have been granted to railroads, or other works of public improvement. The commissions and fees on 160 acres range from \$18 to \$26 in the prairie and Southern States, but the commissions are higher in the Rocky Mountain States and Territories. A homesteader not wishing to remain the full term of five years on his land may, after residence and cultivation, pay for it with cash, warrants or scrip, thus virtually becoming a preëmtor. The preëmtor must settle upon and improve the land. The law as to actual settlement is imperative, but the amount of improvements necessary to satisfy the Land Office authorities varies. In cases of crops ruined by drought or insects an absence of a year is sometimes allowed, in the discretion of the department. A habitable house, according to the means of the settler, and absolutely occupied by himself and family, is a pre-requisite. To make and perfect a claim under the homestead law the settler must be a citizen, native or naturalized, but a preëmption entry may be completed by one who has simply declared his intention to become a citizen. A preëmtor who has obtained title may settle another

tract under the homestead law, and while residing upon his preëmption or homestead claim may enter yet another 160 acres under the "timber culture" law. Lands entered under the homestead and preëmption laws are exempt from taxation during the term of residence necessary to acquire title.

The public lands now for disposal are within the States of Florida, Alabama, Wisconsin, Mississippi, Illinois, Indiana, Michigan, and Ohio, and the States and Territories west of the Mississippi. Texas owns her own lands, and the Indian Territory is not open to settlement. The homestead exemption laws vary in different States and Territories. In some the value exempt from execution ranges from \$1,000 to \$2,500; in others the homestead proper is exempt, whatever its value may be.

The report of the General Land Office for 1889 says: "According to a very moderate estimate the number of land patents issued up to June 30, 1889, to homesteaders, to actual settlers on our public domain under the homestead act, was 297,208, embracing an area of 74,302 square miles, or 47,553,280 acres, and with other donations of lands to the people comprising an area nearly equaling the aggregate area of the original New England States, and that of the great States of New York, Pennsylvania and New Jersey, an area more than four and a half times greater than that certified up to the same date to corporations since 1861 in aid of railroad construction."

HOMEYER, KARL GUSTAV, Swedish author, was born August 13, 1795, at Wolgast, a small town in Pomerania, and died in 1874.

HOMICIDE, in law, is the act of killing a human being, whether such act be criminal or not. Blackstone distinguishes three kinds of homicide—(1) justifiable, (2) excusable, and (3) felonious.

The most important case of justifiable homicide is the execution of a criminal in due course of public justice. This condition is most stringently interpreted. "To kill the greatest of malefactors deliberately, uncompelled, and extra-judicially is murder. * * * And further, if judgment of death be given by a judge not authorized by lawful commission, and execution is done accordingly, the judge is guilty of murder" (Stephen's *Commentaries*, book vi. c. iv.) The execution must be carried out by the proper officer or his deputy; any person executing the sentence without such authority, were it the judge himself, would be guilty of murder. And the sentence must be strictly pursued; to execute a criminal by a kind of death other than that to which he has been judicially condemned is murder.

Homicide committed by an officer of justice in the course of carrying out his duty, as such, is also justifiable; e.g., where a person resists a legal arrest and is killed in the struggle; where officers in dispersing a riotous assemblage kill any of the mob, etc. In these cases the homicide must be shown to have been absolutely necessary. Again, homicide committed for the prevention of forcible and heinous crime, such as violent robbery, or murder, or housebreaking during the night, is justifiable.

Excusable homicide is homicide committed either by misadventure or in self-defense. In the former case, where a man in the course of doing some lawful work, accidentally and without intention kills another, the homicide is excused; e.g., shooting at a mark and undesignedly hitting and killing a man. The act must be strictly lawful, and death by misadventure in unlawful sports is not a case of excusable homicide. Homicide in self-defense is excusable when the slayer is himself in immediate danger of death, and has done all he could to avoid the assault.

HOMILY, HOMILIARIUM, BOOKS OF HOMILIES, meaning communion, intercourse; and especially interchange of thought and feeling by means of words (conversation), was early employed in classical Greek to denote the instruction which a philosopher gave to his pupils in familiar talk. The custom of delivering expositions or comments more or less extemporaneous on the lessons of the day at all events passed over soon and readily into the Christian Church, as may be gathered from the first *Apology* of Justin Martyr, where we read that, in connection with the practice of reading portions from the collected writings of the prophets and from the memoirs of the apostles, it had by that time become usual for the presiding minister to deliver a discourse in which "he admonishes the people, stirring them up to an imitation of the good works which have been brought before their notice." This discourse, from its explanatory character, and from the easy conversational manner of its delivery, was regarded as part of the regular duty of the bishop, but he could devolve it, if he thought fit, on a presbyter, or deacon, or even on a layman. In the smaller and remoter communities it not uncommonly happened that the minister was totally unqualified to undertake the work of preaching; and though, as is curiously shown by the case of Rome, the regular exposition of the appointed lessons was by no means regarded as part of the necessary business of a church, it was generally felt to be advisable that some provision should be made for the public instruction of congregations. Thus the finally fixed meaning of the word homily as an ecclesiastical term came to be a written discourse (generally possessing the sanction of some great name) read in church by or for the officiating clergyman when from any cause he was unable to deliver a sermon of his own. As the standard of clerical education sank during the dark ages, the habit of using the sermons of others became almost universal. Among the authors whose works were found specially serviceable in this way may be mentioned the Venerable Bede, who is credited with no fewer than 140 homilies in the Basel and Cologne editions of his works, and who certainly was the author of many *Homilia de Tempore* which were much in vogue during the eighth and following centuries. Prior to Charlemagne it is probable that several other collections of homilies had obtained considerable popularity, but in the time of that emperor these had suffered so many mutilations and corruptions that an authoritative revision was felt to be imperatively necessary. The result was the well-known *Homiliarium*, prepared by Paul Warnefrid, otherwise known as Paulus Diaconus.

The *Books of Homilies* referred to in the thirty-fifth Article of the Church of England originated at a convocation in 1542, at which it was agreed "to make certain homilies for stay of such errors as were then by ignorant preachers sparkled among the people." Certain homilies accordingly, composed by dignitaries of the lower house, were in the following year produced by the prolocutor; and after some delay a volume was published in 1547 entitled *Certain sermons or homilies appointed by the King's Majesty to be declared and read by all parsons, vicars, or curates every Sunday in their churches where they have cure*.

HOMŒOPATHY (from *ὁμοιοπάθεια*, a similarity of feeling or condition), as a distinctive system of medicine, owes its origin to Hahnemann, a German physician. (See **HAHNEMANN**.) It is customary to regard homœopathy as a mere system of therapeutics, having reference only to the question how and on what principle is disease to be treated. But a careful student of Hahnemann or of his *Organon* will soon discover that the system with which his name is fundamentally associated

is one not merely of therapeutics, but of pathology, and that any complete exposition of it must embrace an account of Hahnemann's views of the ultimate nature and cause of disease, as well as of the remedies by which it is to be combated, and the principles or principle on which these are to be selected.

Hahnemann taught that disease is to be regarded as consisting essentially of the symptoms of it as experienced and expressed by the patient, or as detected by the physician; in other words, that the chief symptoms, or the "totality of the symptoms," constitute the disease, and that disease is in no case caused by any material substance, but is only and always a peculiar, virtual, dynamic derangement of the health. It was a very essential part of Hahnemann's teaching that nature is a bad physician, and not to be much trusted; that drugs are the real curative agents provided by the beneficence of the Almighty; that drugs given to healthy persons have a power of producing symptoms of disease. The ascertainment of the symptoms produced by drugs in healthy persons is called technically "proving," and the record of such provings constitutes a large part of the literature of homœopathy. This power of drugs he perpetually refers to as their "pathogenetic power." His great therapeutical doctrine, for formulating which his followers call him, with doubtful taste, "the Messiah of Medicine," was to this effect, that there is a correspondence between the symptoms produced by any given drug administered to a healthy person, and its power of curing any given disease, and that the remedy for any given disease, that is, for any set of symptoms "in their totality," is that drug which, given to any healthy person, will produce the most perfect imitation of the said set of symptoms; in other words, *Similia similibus curantur*. Further, the dose of medicine is to be so attenuated as to cure the disease without hurting the patient. This attenuation of medicines constitutes, not only the most popular note of the system of Hahnemann, but that feature of it which is most characteristic of his own views and practice, and which in well-known words he declared to be established beyond the reach of cavil from future experience either of allopaths or of practitioners of the "new mongrel system made up of a mixture of allopathic and homœopathic processes." He gives minute directions as to the processes by which this attenuation is to be achieved, the principal of which are trituration, succussion, and dilution. Hahnemann held that medicines became, for curative purposes, more powerful as they became more attenuated; in his last edition of the *Organon* (1833), and in its last pages, he gave the most expressive evidence of his belief in the virtue of attenuation by saying that he could scarcely name one disease which in the last year he and his assistants had not treated with the most happy results, solely by means of "olfaction;" and he added that a patient even destitute of the sense of smell may expect an equally perfect action and cure from the medicine by olfaction. He condemned strongly the administration simultaneously of a number of medicines, and insisted that only one should be given at a time. Finally, it would be unjust to him not to bear in mind that he claimed to base his views and practice on experience and sound experiment. Some points of his system were borrowed by Hahnemann from previous writers — as, indeed, he himself, though imperfectly, admits. Not to mention others, he was anticipated by Hippocrates, and especially by Paracelsus (1495–1541), in his doctrine of *Similia similibus curantur*, if not in its exclusive application.

It is very remarkable that in Hahnemann's enumeration of authors who anticipated him in regard to the doctrine of *Similia*, he makes no mention of the views

of Paracelsus, though the very words seem to be taken from the works of that physician. The other point in Hahnemann's doctrine — that medicines should be tried first on healthy persons — he admits to have been enunciated by Haller. Roughly it has been acted on by physicians in all ages, but certainly more systematically since Hahnemann's time, though the result is often not such as to support his theory in regard to the action of medicine on the diseased as compared with the healthy body.

In the most characteristic feature of Hahnemann's practice — "the potentizing," "dynamizing," of medicinal substances — he appears to have been original. It has been generally affirmed that he was led to adopt his doctrine of "attenuation" by the fact that the medicines he administered produced similar effects to those of the disease, and that in any gross quantity, as he admitted, they would aggravate matters. But another and a chief reason is to be found in his views of the "spiritual," "immaterial," "dynamic" origin of disease and his resentment against the old modes of practice of medicine.

The followers of Hahnemann are true to him in making light comparatively of pathological facts, and giving their main attention to therapeutics. They are still concerned mainly with medicines. For some years Hahnemann's disciples continued pretty faithful to the doctrine of *Similia similibus curantur*, but they were not long in making some changes in it. Doctor Sharp, of Rugby, who had striven hard to overcome objectors, while admitting the doctrine of *Similia*, requires that it have regard, not to mere symptoms, but to the seat and pathology of the case; that the drug used be one which shall affect the organ at fault. Homœopathy cannot become a science till it is founded on what he calls Organopathy, or a much more careful consideration of the seat of disease than is involved in Hahnemann's views, who, he complains, passionately rejected pathology and morbid anatomy. In 1878 Doctor Kidd, the leading consultant among homœopathic practitioners in London, published a book on the *Laws of Therapeutics*. It is true that he does not carry the pluralizing far; he only substitutes two for Hahnemann's one law; but it is not the less a very remarkable departure. He is still faithful to the idea of a relationship between the action of medicines on the healthy and their curative value in sickness; but the law of *Similia* is sadly compromised. "In most cases that relationship is either of *similarity* or of *contrariety*." "Looking," says he, "to the observation of facts apart from theoretic speculations, two primary laws of therapeutics unfold themselves. Those two laws of therapeutics may well be called Galen's law, founded upon the rule of *contraria contrariis*, and Hahnemann's or the homœopathic law, founded upon the relationship of similars." The practice of Hahnemann as to the use of highly attenuated doses of medicine is evidently not more closely adhered to than his doctrine of *Similia*. This fact is the subject of complaint in homœopathic journals. The *Medical Investigator* says reprovingly: "How many claiming to be homœopaths are daily entirely disregarding the law of *Similia*. It is getting to be quite a rare thing to hear of a homœopathic practitioner conducting a serious case from beginning to end without using as such cathartics, sudorifics, diuretics, etc., in direct opposition to our law; not only are these drugs used in this way, but there are some also go so far as to say that they cannot be dispensed with." Doctor Wyld, the vice-president of the British Homœopathic Society, in a letter to Dr. W. B. Richardson, published in the *Lancet*, arguing for an abolition of the schism of the profession on this question, thus sums up the admissions which he as a somewhat representative man was prepared to make: "First, that

the views expressed by Hahnemann are often extravagant and incorrect; *Secondly*, that Hippocrates was right when he said some diseases are best treated by similars and some by contraries, and therefore it is unwise and incorrect to assume the title of homœopathist; *Thirdly*, that although many believe that the action of the infinitesimal in nature can be demonstrated, its use in medicine is practically by a large number in this country all but abandoned." It must not, however, be supposed that there are not many true believers in Hahnemann's doctrines both of *Similia*, etc., and of infinitesimal doses, extending even to olfactions.

Homœopathy has a considerable number of adherents in Great Britain, in the United States, and on the continent of Europe. In order to ascertain the esteem accorded to it in the land of its origin, inquiries have been made of neutral and unbiased authorities, and the general result is that it has no scientific recognition, but that many of the public believe in it, and consult practitioners who profess to practice it. The system has no place in any of the universities of Germany, nor does it seem to have a single school of its own in the entire German empire. It is universally condemned in Germany by men who have anything to do with biological science, and even in the lectures on therapeutics it is not mentioned at all. In Great Britain the Medical Act of 1858 gives power to the Privy Council severely to prohibit attempts by any examining body to impose restrictions as to any theory of medicine or surgery on candidates for examination. There is a homœopathic hospital with 100 beds in London, to which is attached a homœopathic school. Homœopathy is not strong in England. In the United States homœopathy has naturally had freer scope than in Europe. Some have estimated the proportion of homœopathic practitioners in the States as being one-eighth of the whole number of legally qualified practitioners. Every State determines for itself the conditions of qualification in medicine; and there is thus a vast number of separate medical schools giving both education and diplomas. Consequently there is a serious inequality in the severity of medical education and examination.

In all countries the doctrine of homœopathy is still without broad scientific recognition; and certainly in England its chief representatives are anxious to cease their existence as a distinctive school, and have, by their avowed departure from Hahnemann's law of *Similia*, and his mode of attenuating and administering medicines, brought themselves under the severest condemnation of their master's few faithful followers, among whom are still included men of high character. We need not discuss in detail the individual doctrines of Hahnemann, especially those just referred to, as they are scarcely fought for by those who now represent what remains of the homœopathic school. Hahnemann's fundamental views of disease deserve more attention. He despised any deep study of disease, and theorized about it instead. Had he carefully inquired into the nature and natural history of disease as Hippocrates did, or as he himself inquired into the sensations of those who took infinitesimal doses, he would have done more for the world and his own reputation. Hahnemann was easily captivated by theories, and not very sound in his reasoning. But underlying all his system, as we have seen, was the idea that the causes of disease were impalpable, immaterial, spiritual, dynamic. And this great foundation was rotten. Modern medicine is doing some of its best work in showing the material and the visible character of the causes of many of the commonest diseases, and suggests this in many cases where it has not as yet been demonstrated. The cause of many diseases is shown to be a living

germ or particle which can be discerned under the microscope, can be carried on a lancet or in a tube, and inserted under the skin so as to produce its peculiar disease. This is true of small-pox, Hahnemann notwithstanding. The germ can be preserved or it can be killed, and thus disease can be propagated or prevented. The close air of workshops, which generates consumption in such amount, can be shown to be full of impurities, chemical or organic. The causes of other diseases are often, not merely visible under a microscope, but coarsely visible. We have been lately told on high authority that to produce certain forms of blood-poisoning one or two ounces at least of septic fluid are necessary. So with other forms of common disease. Alcohol does not destroy a liver or kidney in any dynamic or immaterial form, but in coarse quantities diligently repeated. The lead which paralyzes the painter's wrist is not a "spiritual" thing. It is an accumulation of matter in the wrong place, and enters his body in palpable quantities, and, what is more, can be recovered in similar quantities from his body. So with the uric acid or its salts in the blood of a person who has inherited his father's gout, and perhaps his port wine. It is not a "spiritual" affair at all, but can be demonstrated chemically and under the microscope. The itch, to whose mysterious workings Hahnemann attributed two-thirds of the internal diseases of the body, including mania, cancer, gout, etc., is easily demonstrated to be dependent on an ugly crab-like insect, which can be destroyed in a few hours with sulphur, when there is an end both of it and of the itch. We are aware of the euphemistic form which is given to Hahnemann's views of the psoric or itch disease; and we are partly disposed to admit, with the late Professor Henderson, the ablest and wisest of Hahnemann's supporters in England, that Hahnemann was unfortunate in the exposition of his own views of this subject. But Hahnemann's fine but fundamental theories about the spiritual and dynamic origin of disease are all exploded by the revelations of modern pathology, and their demolition only completes that of his therapeutical theories which rested on them.

Still it does not follow that homœopathy has been of no use. Hahnemann deserves the credit of being the first to break decidedly with the old school of medical practice, in which, forgetful of the teachings of Hippocrates, nature was either overlooked or rudely opposed by wrong and ungentle methods. He was so dissatisfied with this system that he gave up practice. We can scarcely now estimate the force of character and of courage which was implied, eighty years back, in abandoning the common lines of medicine. More than this, he and his followers showed results in the treatment of disease which compared very favorably with the results of orthodox practice. But they entirely missed the right conclusion from their experience. Let us take, for example, the statistics of the treatment of inflammation of the lung (pneumonia), adduced, not by Hahnemann—for it is one of his very weak points that he did not record cases—but, after his death, by Doctor Fleischmann of Vienna. Doctor Henderson quotes these and other homœopathic statistics with great satisfaction, and undoubtedly and properly they produced a great effect, showing a mortality of one in twenty-one cases only, which was a much higher percentage of success than under the ordinary treatment. But these statistics have since been entirely eclipsed by the minute and historical record of cases treated in the Edinburgh Infirmary, where the late Dr. Hughes Bennett treated 105 cases of acute pneumonia, extending over sixteen years, without one death. Still we must admit that Fleischmann's results were greatly better than the old ones, and that but for the homœopathic practice, which most

practitioners regarded as a negation, tantamount to leaving the disease to nature, the emancipation from traditional methods of treatment would have been much slower than it was.

Besides this, homœopathy may be credited with two other services. It has given prominence to the therapeutical side of medicine, and has done much to stimulate the study of the physiological action of drugs. No doubt Hahnemann completely erred in despising nature, and in magnifying medicines in the cure of disease. But his very methods showed, unintentionally on his part, what nature could do; and his devotion and that of his school to therapeutics has acted as a somewhat deserved rebuke to those physicians who get so absorbed in the study of disease as to forget that the great interest of mankind in it is to have it cured with as little delay as possible. It may be admitted that homœopathy has done some service in directing more special attention to various powerful drugs, such as aconite, nux vomica, belladonna, and to the advantage of giving them in simpler forms than were common before the days of Hahnemann.

HONDA, or **SAN BARTOLOMEO DE HONDA**, a town of the republic of Colombia, in the State of Cundinamarca, on the left bank of the river Magdalena, about 575 miles from the sea.

HONDECOETER, **MELCHIOR D'**, painter, was born at Utrecht, it is said, about 1636, and died at Amsterdam, April 3, 1695.

***HONDURAS** is in size the third of the States of Central America. Its shape is irregular and its boundaries are not altogether defined, but it lies between 13° 10' and 16° 1' north Latitude, and 83° 10' and 88° 40' Longitude west from Greenwich. It is bounded on the north by the Caribbean Sea, on the east and south by Nicaragua, and on the south and west by the Pacific Ocean, and the States of Salvador and Guatemala. Its area is estimated at 42,658 square miles, including the Bay Islands in the Caribbean Sea. Its coast line on the Caribbean is nearly 400 miles in length, along which are the ports of Truxillo, Puerto Cortez, Omoa, Roatan, and La Ceiba. On the Pacific coast it has a frontage of only forty miles, in the Gulf of Fonseca, with the single port of Amapala. The surface of the country is variegated. Along each coast is a strip of low land, back of which rises a table-land, broken by mountain ridges and intervening valleys. The great chain of the Cordilleras, a continuation of the Rocky Mountains in the United States and the Andes in South America, traverses the country from northwest to southeast, rising at the highest point, Selaque Mountain, to more than 10,000 feet. Although in the volcanic region, Honduras at present contains no active volcanoes, and is less subject to earthquake shocks than some of its neighbors. The whole country is abundantly watered by rivers, which however are not large enough for navigation save by small boats. There are several lakes the largest of which, Yojoa, is more than 30 miles long. The climate is variable. Along the coast it is hot and malarial and other fevers prevail. On the uplands the temperature is moderate, the average being from 70° to 75° Fahrenheit. On the highest ground there are sometimes heavy frosts, but snow is unknown, even on the highest peaks. In the elevated inland regions the climate is both comfortable and salubrious.

Industries and Commerce.—The natural wealth of Honduras is very great, in timber, minerals, nuts and fruits. There are vast forests of pine, oak, mahogany, and other valuable woods, the trees often attaining enormous size. Dye woods and spices also abound. The country is prolific of cocoa nuts, indigo, sarsaparilla, bananas, and india-rubber, while almost every variety of tropical and subtropical vegetation can be

made to flourish. Unfortunately, little attention has been paid to agriculture. The minerals found in paying quantities include gold, silver, iron, copper, zinc, antimony, platinum and copper, and some deposits of tin have been reported. There are beds of lignite, said to be of value, and many precious stones have been found, including some of the finest opals in the world. Cattle raising has long been one of the chief occupations of the people.

In the fiscal year ending July 31, 1902, imports into Honduras were valued at \$1,692,452, of which \$1,133,885 were from the United States. In the year 1900-1901 exports from Honduras were worth \$2,510,307, of which 70 per cent. were to the United States. The chief exports were: Ores, \$925,321; fruits, \$789,828; cattle, \$226,270; coffee, \$111,729; woods, \$111,348; tobacco, \$86,650; hides and skins, \$74,034; indigo, \$43,589; rubber, \$33,680; sarsaparilla, \$35,933. One of the chief manufacturing industries is that of so-called "Panama" hats. Mining and railroad enterprises are almost exclusively conducted by United States companies.

In the year 1900-1901 there arrived at the ports of Honduras 2,999 vessels, of which 618 were steamers.

The unit of currency in Honduras is the silver peso, worth, in 1904, about 40 cents in United States money. The metric system of weights and measures has been in legal use for some years, but the old Spanish standards are still largely used.

Government.—Honduras has a nominally Republican form of government, with a President, elected by the people for four years, and a Congress of Deputies elected at the ratio of one for every 10,000 inhabitants. There is a cabinet of ministers, of Interior, Public Works, War, Finance, Public Instruction, and Justice. The capital is Tegucigalpa, an inland city of 27,000 population. The country is divided for administrative purposes into 16 departments. Roman Catholicism is the prevailing religion, but the State supports no church and freedom is guaranteed by the Constitution to all creeds. There is a free, compulsory and entirely secular system of public education, the common schools numbering 683 with 23,767 scholars, and the high schools 23, with 1,588 scholars. There is a central university at Tegucigalpa, with colleges of law, medicine, science, and political science, and there is also a college of law at Cornayagua. In 1900 Honduras contained 245 post offices and 160 telegraph offices.

History.—The history of Honduras begins with the fourth voyage of Columbus. On August 14, 1502, that great discoverer landed on the shore of the Bay of Truxillo, and there first reached the mainland of the American continent. Later, at the mouth of the Rio Tinto, he took formal possession of the country for Spain. The name Honduras is said to have been applied to it by him on account of the depth of the water off the coast, the name meaning "deeps" or "deep waters." Honduras was conquered by Spain by Cortez, in 1524, and thereafter for nearly three centuries formed a province of the Kingdom of Guatemala, the latter embracing nearly all of Central America. War, pestilence and slavery almost exterminated the native population, with the exception of a few small tribes. In 1821 Central America declared its independence of Spain, and a year later was divided into the five separate States of which it now consists. These were united in a federal union until 1838, since which time that union has been dissolved and Honduras has been a sovereign and independent State. In common with the other Central American States it has suffered from frequent revolutions and other disturbances. Its present Constitution was established in October, 1894.

Population.—The latest census of Honduras was taken in 1902, and showed the population to be 543,741, of whom 267,304 were males and 276,437 females. Other enumerations made at the same time, and believed to be more trustworthy, show a population of 744,991. To these figures should be added about 50,000 to cover certain unenumerated Indian tribes. The chief cities in 1902 were Tegucigalpa, 26,266; Juticalpa, 17,800; Cedros, 12,220; Nacaome, 12,040;

Pespire, 11,880; Danli, 11,813; Santa Rosa, 10,838; Choluteca, 10,820; and Intibuca, 10,070. W. FLETCHER JOHNSON.

HONDURAS, BRITISH, otherwise known as **BELIZE**, is a British colony on the peninsula of Yucatan, with an area of about 8,000 square miles. Its climate is not unhealthy, although the rainfall is very great. The population (1901), 37,000, mostly negroes and half-breeds. Belize, the capital, has 9,075 inhabitants and is a place of considerable trade. Mahogany and logwood are the principal articles of export.

HONE. Under the name of hones, whetstones, or sharpening stones, a variety of finely silicious stones are employed for whetting or sharpening edge tools, and for abrading steel and other hard surfaces. They generally are prepared in the form of flat slabs, or small pencils or rods of the material, but some are made with the outline of the special instrument they are designed to sharpen. Their abrading action is due to the quartz or silica which is always present in predominating proportion, some kinds consisting of almost pure quartz, while in others the silicious element is very intimately mixed with aluminous or calcareous matter, forming a uniform, compact stone, the extremely fine silicious particles of which impart a remarkably keen edge to the instruments for the sharpening of which they are applied.

HONE, WILLIAM (1780-1842), a political satirist and a writer on antiquarian and miscellaneous subjects, was born at Bath, June 3, 1780, and died in 1842.

HONESDALE, a Pennsylvania town, lies on the Lackawaxen river, in Wayne county. It has some manufactures—glass, machinery, and cloth fabrics—and is a railroad, telegraph, and banking town. Its population numbered (1900) 2,864.

HONEY, a sweet viscid liquid, obtained by bees chiefly from the nectaries of flowers, *i.e.*, those parts of flowers specially constructed for the elaboration of honey, and after transportation to the hive in the proventriculus or crop of the insects, discharged by them into the cells prepared for its reception. Whether the nectar undergoes any alteration within the crop of the bee is a point on which authors have differed. The abdomen in these insects, owing to the distensibility of the membrane connecting its segments, becomes converted into a globular thin-walled sac by the accumulation within it of the nectar supplied to them by their working comrades. By the Rev. H. C. McCook, who discovered the insect in the Garden of the Gods, Colorado, the honey-bearers were found hanging by their feet in groups of about thirty, to the roofs of special chambers in their underground nests, their large globular abdomens causing them to resemble "bunches of small Delaware grapes."

It is the popular saying that where is the best honey there also is the best wool; and a pastoral district, since it affords a greater profusion of flowers, is superior for the production of honey to one under tillage. Dry, warm weather is that most favorable to the secretion of nectar by flowers. The origin of the honey-yielding properties manifested specially by flowers among the several parts of plants has been carefully considered by Darwin, who regards the saccharine matter in nectar as a waste product of chemical changes in the sap, which, when it happened to be excreted within the envelopes of flowers, was utilized for the important object of cross-fertilization, and subsequently was much increased in quantity, and stored in various ways. It has been noted with respect to the nectar of the fuchsia that it is most abundant when the anthers are about to dehisce, and absent in the unexpanded flower.

The term "virgin-honey" is applied to the honey of young bees which have never swarmed, or to that which flows spontaneously from honeycomb with or without

the application of heat. The honey obtained from old hives, considered inferior to it in quality, is ordinarily darker, thicker, and less pleasant in taste and odor. The yield of honey is less in proportion to weight in old than in young or virgin combs.

So rapid of late years has been the development of bee-keeping in the United States, that the taking of steps to secure the fullest and most accurate details with respect to that industry has been deemed necessary by the commissioners of agriculture. It has been estimated by several intelligent bee-keepers that there are in the United States 700,000 hives of bees, owned by 35,000 people, of whom at least 30,000 are farmers possessing on an average not more than three hives each, the remaining 5,000 being professional apiarians. Mr. G. M. Doolittle, of Borodino, N. Y., on the Auburn branch of the New York Central Railway, obtained an average of 100 pounds of honey apiece from his hives, and from one of them the exceptionally large yield of 700 pounds. It is not unreasonable to say that the hives in the United States afford each a net supply of about 50 pounds of surplus honey, which, selling at 20 cents (10d.) per pound, returns a good profit to the owners. All American honey is classed by the apiculturist according to the plants from which it is derived. It is only in rare cases that pasturage is specially cultivated for the bees. In the States east of the Rocky Mountains there are three chief sources of honey. Those which yield the most delicately flavored and whitest and therefore most valuable commodity (see above) are, first, the immense forests of basswood, the honey from which has perhaps a slight minty flavor, and, secondly, white clover grass, cultivated throughout the States for hay and stock pasture, which furnishes a honey pronounced by competent judges superior to that of the world-renowned Hymettus. Bees having access to both basswood and white clover frequently store the honey from each in the same cells. The third and often richest source of supply is buckwheat, which blossoms after the basswood and white clover have ceased to yield. The pungent honey obtained therefrom, though by its dark color rendered unsuitable for the table, is greatly valued for manufacturing purposes, more especially in the brewing of fine beer, since it forms a perfectly clear solution, ferments well, and is richer in saccharine matter than the glucose commonly employed by brewers, which moreover is apt to be contaminated with the acids employed in its preparation. Buckwheat honey is also accounted a good remedy in bronchial affections, and is therefore in request for the making of cough mixtures. The day is probably not far distant when the refining of the large quantities of dark honey which are harvested will be undertaken on an extensive scale.

For the successful prosecution of bee-keeping energy and perseverance, as well as experience and considerable capital, are requisite. There are several large apiaries in the United States, those of California being probably the largest in the world. The Californian honey, owing to the innocuous nature of the flowers, from which it is procured, is devoid of the colic-producing properties ascribed to some other varieties of honey. Active operations begin in February, and in March or April the bees swarm. The taking of the honey commences usually about May 20th. From the early part of August till as late as October the flowers provide no more honey than is just sufficient for the subsistence of the bees. When October has begun, though the air is still mild, the bees cease to work, becoming semi-dormant, except for an hour or two every eight or ten days, when they fly near their hives in the sunshine. The fact that honey until the middle of the sixteenth

century was the only sweet in general use, and that the aggregate annual consumption of sugar is now from 2,000,000 to 2,500,000 of tons, points to the conclusion that apiculture, if skillfully and extensively conducted, might ere long become productive of results of very high importance to commerce.

HONEY-EATER, or HONEY-SUCKER, names applied by many writers in a very loose way to a large number of birds, some of which, perhaps, have no intimate affinity; but here used in a more restricted sense for what, in the opinion of a good many recent authorities, should really be deemed the Family *Meliphagide*—excluding therefrom the *Nectariniide* or SUN-BIRDS (which see), as well as the genera *Promerops* and *Zosterops* with whatever allies they may possess.

HONEY-GUIDE, a bird so called from its habit or supposed habit of pointing out to man and to the ratel the nests of bees. Stories to this effect have been often told, and may be found in the narratives of many African travelers, from Bruce to Livingstone.

HONEY-SUCKLE, a genus of climbing, erect, or prostrate shrubs, of the natural order *Caprifoliaceae*, so named after the German botanist Adam Lonicer. The British species are *L. Periclymenum*, the woodbine, *L. Caprifolium*, and *L. Xylosteum*. Some of the garden varieties of the woodbine are very beautiful, and are held in high esteem for their delicious fragrance; even the wild plant, with its pale flowers, compensating for its sickly looks "with never-cloying odors." The North American sub-evergreen *L. sempervirens*, with its fine heads of blossoms, commonly called the trumpet honeysuckle, is a distinct and beautiful species producing both scarlet and yellow flowered varieties, and the Japanese *L. brachypoda aureo-reticulata* is esteemed for its charmingly variegated leaves.

HONFLEUR, a town of France, at the head of a canton in the arrondissement of Pont l'Évêque in the department of Calvados, is situated on the south side of the estuary of the Seine directly opposite Havre, and about ten miles to the north of Pont l'Évêque and thirty-seven miles to the northeast of Caen.

HONG-KONG, properly HIANG-KIANG (the place of "sweet streams"), an important British island-possession, situated off the southeast coast of China, opposite the province of Kwang-tung, on the east side of the estuary of the Chu-Kiang or Canton river, thirty-eight miles east of Macao and seventy-five southeast of Canton. It is one of a small cluster named by the Portuguese "Ladrones" or Thieves, on account of the notorious habits of their old inhabitants. Extremely irregular in outline, it has an area of twenty-nine square miles, measuring ten and one-half miles in extreme length from northeast to southwest, and varying in breadth from two to five miles. From the mainland it is separated by a narrow channel, which at Hong-Kong roads, between Victoria, the island capital, and Kaulung Point, is about one mile broad, and which narrows at Ly-ce-moon Pass to little over a quarter of a mile. The southern coast in particular is deeply indented; and there two bold peninsulas, extending for several miles into the sea, form two capacious natural harbors, namely, Deep Water Bay, with the village of Stanley to the east, and Tytam Bay, which has a safe, well-protected entrance showing a depth of from ten to sixteen fathoms. An in-shore island on the west coast, called Aberdeen or Tapichan, affords protection to the Shekpywan or Aberdeen harbor, an inlet provided with a granite graving dock, the caisson gate of which is sixty feet wide, and the Hope dock, opened in 1867, with a length of 425 feet and a depth of 24 feet. Opposite the same part of the coast, but nearly two miles distant, rises the largest of the surrounding islands, the

Lamma, whose conspicuous peak, Mount Stenhouse, attains a height of 1,140 feet, and is a landmark for local navigation. On the northern shore of Hong-Kong there is a patent slip at East or Matheson Point, which is serviceable during the northeast monsoon, when sailing vessels frequently approach Victoria through the Ly-ce-moon Pass. The ordinary course for such vessels is from the westward, on which side they are sheltered by Green Island and Kellett Bank. There is good anchorage throughout the entire channel separating the island from the mainland, except in the Ly-ce-moon Pass, where the water is deep; the best anchorage is in Hong-Kong roads, in front of Victoria, where, over good holding ground, the depth is five to nine fathoms. The inner anchorage of Victoria Bay, about half a mile off shore and out of the strength of the tide, is six to seven fathoms. Victoria, the seat alike of government and of trade, is the chief center of population, but in recent years a tract of five square miles on the mainland has been covered with public buildings and villa residences. Practically an outlying suburb to Victoria, Kau-lung (Nine Dragons), or as it is commonly called Kowloon, is free from the extreme heat of the capital, being exposed to the southwest monsoon. Numerous villas have also been erected along the beautiful western coast of the island, while Stanley, in the south, has lately been attracting attention by its excellent qualifications as a watering-place. Pop. (1901), 283,975.

HONITON, a municipal borough and market-town of England, county of Devon, is pleasantly situated on a rising ground on the left bank of the Otter and on the London and South-Western railway, sixteen miles east-northeast of Exeter.

HONOLULU. See HAWAIIAN ISLANDS.

HONORIUS, FLAVIUS AUGUSTUS, was emperor of the West from 397 to 425 A.D. His reign of twenty-eight years was one of the most eventful in the Roman annals; the weakness and timidity of the emperor coöperated with the attacks of the Goths and Vandals in promoting the rapid disintegration of the empire. But his influence on the current of events was purely negative.

HONORIUS I., pope from 625 to 638, succeeded Boniface V. The festival of the Elevation of the Cross is said to have been instituted during his pontificate, which was marked also by considerable missionary enterprise. Honorius in his lifetime had favored the formula proposed by the emperor Heraclius, with the design of bringing about a reconciliation between the Monophysites and the Catholics, which bore that Christ had accomplished His work of redemption by one manifestation of His will as the God-man. For this he was, more than forty years after his death, anathematized by name along with the other Monothelite heretics by the council of Constantinople in 680; and this condemnation was subsequently confirmed by more than one pope, particularly by Leo II., as has been abundantly proved by unimpeachable evidence against the contentions of Baronius and Bellarmine. Honorius I. was succeeded by Severinus.

HONORIUS II. (Lambert of Ostia), pope from 1124 to 1130, succeeded Calixtus II. As papal legate he had been one of the framers of the concordat of Worms (1122). During his pontificate the Premonstratensian order, and also that of the Knights Templar, received papal sanction. His successor was Innocent II.

HONORIUS III., pope from 1216 to 1227, was the successor of Innocent III., whose uncompromising policy in the struggle between the papacy and the empire he had not firmness and vigor to continue. He consented to crown Frederick II. as Holy Roman em-

peror in 1220, although the engagements made with his predecessor had not been fulfilled; the promises which he himself had exacted he was somewhat slow to urge and it was left to his successor, Gregory IX., to insist upon their accomplishment. He gave papal sanction to the Dominican order in 1216, and to the Franciscan in 1223; and during his pontificate also many of the tertiary orders first came into existence.

HONORIUS IV. succeeded Martin IV., and was pope for two years (1285–1287). After an uneventful pontificate he was succeeded by Nicholas IV.

HONTHEIM, JOHANN NIKOLAUS VON (1701–1790), a zealous opponent of Ultramontanism, was born at Treves, January 27, 1701. He died at Montquintin, Luxembourg, September 2, 1790.

HONTHORST, GERARD VAN (born at Utrecht 1590, died at Utrecht 1656), was brought up as a painter at the school of Bloemart, who exchanged the style of the Franks for that of the pseudo-Italians at the beginning of the sixteenth century. His most attractive pieces are those in which he cultivates the style of Caravaggio, those, namely, which represent taverns, with players, singers, and eaters. He shows great skill in reproducing scenes illuminated by a single candle.

HOOCH, PIETER DE, a Dutch painter of note, was born, it is thought, about 1632, and died, it is supposed, in 1681 in Haarlem.

HOO-CHOW-FOO, a city of China, in the province of Che-Keang, lies a little to the south of Lake Tai-hoo, in the midst of the central silk district.

HOOD, ROBIN. See ROBIN HOOD.

HOOD, THOMAS (1789–1845), humorist and poet, born May 23, 1789, was the son of Mr. Hood, bookseller, of the firm of Vernor & Hood, a man of intelligence, and the author of two novels.

In 1821 Mr. John Scott, the editor of the *London Magazine*, was killed in a duel, and that periodical passed into the hands of some friends of Hood, who proposed to him to take a part in its publication. His installation into this congenial post at once introduced him to the best literary society of the time; and in becoming the associate of such men as Charles Lamb, Cary, De Quincey, Allan Cunningham, Proctor, Talfourd, Hartley Coleridge, the peasant-poet Clare, and other contributors to that remarkable miscellany, he gradually developed his own intellectual powers, and enjoyed that happy intercourse with superior minds for which his cordial and genial character was so well adapted, and which he has described in his best manner in several chapters of *Hood's Own. Odes and Addresses*—his first work—were written about this time, in conjunction with his brother-in-law, Mr. J. H. Reynolds, the friend of Keats; and it is agreeable to find Sir Walter Scott acknowledging the gift of the work with no formal expressions of gratification, but "wishing the unknown author good health, good fortune, and whatever other good things can best support and encourage his lively vein of inoffensive and humorous satire." *Whims and Oddities, National Tales, Tynney Hall*, a novel, and *The Plea of the Midsummer Fairies* followed. In these works the humorous faculty not only predominated, but expressed itself with a freshness, originality, and power which the poetical element could not claim. He started a magazine in his own name, for which he secured the assistance of many literary men of reputation and authority, but which was mainly sustained by his own intellectual activity. From a sick-bed, from which he never rose, he conducted this work with surprising energy, and there composed those poems, too few in number, but immortal in the English language, such as the *Song of the Shirt*, the *Bridge of Sig* *his*

and the *Song of the Laborer*, which seized the deep human interests of the time, and transported them from the ground of social philosophy into the loftier domain of the imagination. Prolonged illness brought on straitened circumstances; and application was made to Sir Robert Peel to place Hood's name on the pension list with which the British state so moderately rewards the national services of literary men. This was done readily and without delay, and the pension was continued to his wife and family after his death, which occurred on May 3, 1845.

HOOD, TOM, son of Thomas Hood, and the inheritor of similar, though less brilliant, literary talents, was born at Lake House, Wanstead, January 19, 1835. He died November 20, 1874.

HOOD, SAMUEL HOOD, FIRST VISCOUNT, English admiral, was born in 1724, at Butleigh, in Somersetshire. For distinguished services in the American and French Revolutionary wars he was raised to the English peerage, with the title of Viscount Hood of Whitley. In 1799 he was promoted to the rank of admiral, and in 1804 he received the grand cross of the Bath. He died at Bath, June 27, 1816.

HOOF'S. The healthy soundness of the horse's foot is mainly preserved by permitting it to grow uninjured by the rasp and knife, while its toughness is secured, and undue dryness and evaporation prevented, by smearing daily the crust, sole and frog with a little glycerine, or a mixture made by melting together a quarter of a pound each of tar, honey, beeswax, and glycerine, with a pound of lard. Softness and brittleness of the hoof, which are fruitful sources of cracks and corns, may be remedied by the use of such dressings, by placing the feet for several hours daily in thick, woolen swabs, kept cool and moist by frequent applications of cold water, and by encouraging a more healthy growth of horn by occasional mild blisters round the coronary band. Cracks, or sand-cracks, as they are termed, mostly occur among horses much upon the road, cause lameness and unsoundness.

HOOF, PIETER CORNELISSEN, Dutch poet and historian, was born at Amsterdam, March 16, 1781, and died in 1647.

HOOGVEEN, a village and commune of the Netherlands, in the province of Drenthe, about twelve miles northeast of Meppel, on the railway opened in 1870 between that town and Groningen.

HOOGHLY. The Hooghly river is the most westerly and commercially the most important channel by which the Ganges enters the Bay of Bengal. It takes its distinctive name near the town of Santipur, about 120 miles from the sea. The stream now known as the Hooghly represents three western deltaic distributaries of the Ganges—viz., (1) the Bhágirathi, (2) the Jalangi, and (3) part of the Mátábhángá.

HOOGHLY, a British district in the lieutenant-governorship of Bengal. The area, including the magistracy of Howrah, amounted in 1888 to 1,497 square miles. It forms the southeastern portion of the Bardwán division, and is bounded north by the district of Bardwán, east by the Hooghly river, separating it from the districts of Nadiyá and the Twenty-Four Paganás; south by the Rupnáráyan, separating it from Midnapur, and west by the same river, separating it from Midnapur, and by Bardwán district. Population, 1,500,000.

HOOGSTRATEN, SAMUEL DIRKSZ VAN, Dutch artist, was born, it is said, in 1627, at The Hague, and died at Dort, October 19, 1678.

HOOK, THEODORE EDWARD, novelist, dramatist, and improvisatore, was born in London, September 22, 1788. He died August 24, 1841. His writings in great part are of a purely ephemeral character; the less transient, touched though they be with a sparkling fancy,

have long since passed out of favor; while the greatest triumphs of the improvisatore may be said to have been written in wine. Putting aside, however, his claim to literary greatness, Hook will be remembered as one of the most brilliant, genial, and original figures of Georgian times.

HOOK, WALTER FARQUHAR, was born in London, March 13, 1798. His literary works, which are numerous, attain the limit of their design in advancing some incidental plea or in contributing to the student's resources. He died in 1875.

HOOKE, ROBERT, an original and ingenious experimental philosopher, was born at Freshwater, in the Isle of Wight, July 18, 1635. He died in 1703.

HOOKER, JOSEPH, American general, was born in Old Hadley, Mass., November 13, 1814. He was educated at the Military Academy at West Point, 1833-37, and immediately commissioned second lieutenant in the 1st artillery. In the war with Mexico (1846-48) he served as aide-de-camp and assistant adjutant-general, and was breveted captain, major, and lieutenant-colonel, and commissioned captain for meritorious services in the engagements at Monterey, National Bridge, and Chapultepec. He was transferred with his regiment to California in 1849. In 1853 he resigned his commission and bought a large farm near Sonoma, which he managed successfully till 1858, when he was made superintendent of military roads in Oregon. Upon the opening of hostilities in the civil war of 1861-65, he sacrificed his fine estate and offered his sword to the Federal Government. He was commissioned brigadier-general of volunteers, May 17, 1861, and major-general May 5, 1862. At Williamsburg, May 5th he attacked a strong Confederate position, and for nine hours maintained the fight, inflicting and sustaining heavy loss, and winning the title of "Fighting Joe." He was engaged at Fair Oaks, June 1st, and at Malvern Hill, July 1st, and did signal service at Charles City Cross Roads, June 29th, when his division aided in holding a vital position on the flank of the Union Army, in its noted "change of base." In the campaign of Northern Virginia, under General Pope, August 27 to September 1, 1862, he led his division in the actions at Bristow's Station, Manassas, and Chantilly. In the Maryland campaign, September 6-17 (under General McClellan), he commanded the first corps, and gallantly carried the north pass of South Mountain, opening the way for the advance of the army.

He opened the battle of Antietam on the 14th, and on the following morning was pitted against "Stonewall" Jackson, at the noted "cornfield," where he used his artillery with terrible effect, but received a painful wound, and was borne from the field. He was commissioned brigadier-general in the United States army September 20, 1862, and in the disastrous battle of Fredericksburg, under Burnside, he commanded the center grand division (third and fifth corps). He commanded the army of the Potomac January 26 to June 28, 1863, and, having by a fine strategic movement thrown his army across a turbulent stream in face of the foe, fought a severe battle at Chancellorsville, where he was seriously injured; and, his army being thrown into an unfavorable position by the unexpected giving way of his right wing, he decided to retire. He was relieved at his own request, on June 28th, with the thanks of Congress "for skill, energy, and endurance" in the beginning of the Gettysburg campaign. He commanded the twentieth corps (eleventh and twelfth corps consolidated) in the Atlanta campaign, winning special distinction in the night battle of Wauhatchie, and at Lookout Mountain. For a hundred days, and until the capture of Atlanta, the noise

of battle scarcely ceased, his corps doing signal service at Mill Creek, Resaca, New Hope Church, Pine Mount, Peach Tree Creek, and the siege of Atlanta. He was commissioned brevet-major-general in the United States army, March 13, 1865, and retired from active service at his own request, October 15, 1868. The last years of his life were passed in the neighborhood of New York. He died at Garden City, L. I., October 31, 1879.

HOOKER, RICHARD, author of the *Laws of Ecclesiastical Polity*, was born at Heavitree, near the city of Exeter, about the end of 1553, or beginning of 1554, and died in 1600.

HOOKER, SIR WILLIAM JACKSON, a distinguished English botanist, was born at Norwich, July 6, 1785.

It was mainly by Hooker's exertions that botanists were appointed to the government expeditions. While his works were in progress his herbarium received large and valuable additions from all parts of the globe, and his position as a botanist was thus vastly improved. He received the honor of knighthood from William IV., in 1836, in consideration of his meritorious researches in scientific botany; and, a few years later, in 1841, he was appointed director of the Royal Botanical Gardens of Kew, on the resignation of Mr. Aiton. The attainment of this post had long been the object of his life. The gardens flourished under his administration; the government had confidence in him; and his numerous friends and correspondents took pride in contributing to the scientific needs of his herbarium. From small beginnings the gardens expanded under his direction to 75 acres, with an arboretum of 270 acres; and three museums, enriched with many thousand examples of vegetable products, have been added, forming together, with the magnificent palm-house and conservatories, the most delightful and beautiful resort that the inhabitants of London possess; while his extensive library of reference and admirably arranged herbarium, the greater part of which was presented by Sir William to the country, form a constant attraction to the botanist. He was engaged on the *Synopsis Filicum* with J. G. Baker when an epidemic at Kew brought his valuable life to a close. He died August 12, 1885, in the eighty-first year of his age.

HOOLE, JOHN, translator and dramatist, was born at Moorfields, London, in December, 1727. In 1773 he was promoted to be auditor of Indian accounts, which office he resigned in 1783, and, in 1786, he retired to Abinger, near Dorking, Surrey, where he died April 2, 1803.

HOOPER, JOHN, bishop and martyr, was a native of Somersetshire, and was born about 1495. He was educated at Merton College, Oxford, and after taking his degree of bachelor of arts in 1518 joined the order of Cistercian monks at Gloucester. For a short time he was chaplain to Sir Thomas Arundel, but being warned of the danger to which his Protestant opinions exposed him, he in 1539 made his escape to France. Returning to England shortly afterward, he found that plots were again being laid for his life, and escaped to Ireland disguised as a sailor. In 1549 he returned to England and in 1550 he was presented to the bishopric of Gloucester, but refusing it on account of objections to the oath and vestments, he was summoned before the council, and ultimately was imprisoned for some time in the Fleet, till he intimated that his scruples had been removed. In 1552 he was created bishop of Worcester *in commendam*. On the accession of Mary in the following year he was immediately arrested and sent to the Fleet, and after suffering eighteen months' imprisonment he was on January 29, 1555, tried for heresy and condemned to death. The sentence was carried out on

February 9th, the martyr enduring the agonies of the stake, which on account of the accidental use of green wood were unusually protracted, with great fortitude. Hooper's opinions were more decidedly anti-Romish than those of Cranmer or Ridley, and very nearly identical with those afterward promulgated by the Puritans. He was the author of various sermons and controversial treatises.

HOOPING-COUGH, or WHOOPING-COUGH, an infectious disease of the respiratory mucous membrane, manifesting itself by frequently recurring paroxysms of convulsive coughing accompanied with peculiar sonorous inspirations. It occurs for the most part among children, and only once in a lifetime.

The specific cause of whooping-cough is unknown, but the view which ascribes it to some atmospheric condition appears to derive support from the frequency of this disease as an epidemic; whether, however, that be the presence of a peculiar form of germ, as is held by some, remains as yet undetermined. Although specially a disease of childhood, whooping-cough is by no means limited to that period, but may occur at any time of life, even to old age, should there have been no previous attack. It is most common between the ages of one and four, and is rare after ten.

With respect to the symptoms of whooping-cough, three stages of the disease are recognized, viz., (1) the catarrhal stage, (2) the spasmodic stage, (3) the stage of decline.

The *first stage* is characterized by the ordinary phenomena of a catarrh, with sneezing, watering of the eyes, irritation of the throat, feverishness and cough, but in general there is nothing in the symptoms to indicate that they are to develop into whooping-cough. The catarrhal stage usually lasts from ten to fourteen days. The *second stage* is marked by the abatement of the catarrhal symptoms, but at the same time by increase in the cough, which now occurs in irregular paroxysms both by day and by night. Each paroxysm consists in a series of violent and rapid expiratory coughs, succeeded by a loud sonorous or crowing inspiration—the "whoop." During the coughing efforts the air is driven with great force out of the lungs, and as none can enter the chest the symptoms of impending asphyxia appear. The patient grows deep-red or livid in the face, the eyes appear as if they would burst from their sockets, and suffocation seems imminent till relief is brought by the "whoop"—the louder and more vigorous the better. Occasionally blood bursts from the nose, mouth, and ears, or is extravasated into the conjunctiva of the eyes. A single fit rarely lasts beyond from half to three-quarters of a minute, but after the "whoop" another recurs, and of these a number may come and go for several minutes. The paroxysm ends by the coughing or vomiting up of a viscid tenacious secretion, and usually after this the patient seems comparatively well, or, it may be, somewhat wearied and fretful. The frequency of the paroxysms varies according to the severity of the case, being in some instances only to the extent of one or two in the whole day, while in others there may be several in the course of a single hour. Slight causes serve to bring on the fits of coughing, such as the acts of swallowing, talking, laughing, crying, etc., or they may occur without any apparent exciting cause. In general children come to recognize an impending attack by a feeling of tickling in the throat, and they cling with dread to their mothers or nurses; or take hold of some object near them for support during the paroxysm; but although exhausted by the severe fit of coughing they soon resume their play, apparently little the worse. The attacks are on the whole most severe at night. This stage of the disease usually continues

for thirty to fifty days, but it may be shorter or longer. It is during this time that complications are apt to arise which may become a source of danger greater even than the malady itself. The chief of these are inflammatory affections of the bronchi and lungs, and convulsions, any of which may prove fatal. When, however, the disease progresses favorably, as it usually does, the *third or terminal stage* is announced by the less frequent paroxysms of the cough, which generally loses in great measure its "whooping" character. The patient's condition altogether undergoes amendment, and the symptoms disappear in from one to three weeks. It is to be observed, however, that for a long period afterward in any simple catarrh from which the patient suffers the cough often assumes a spasmodic character, which may suggest the erroneous notion that a relapse of the whooping-cough has occurred.

In severe cases it occasionally happens that the disease leaves behind it such structural changes in the lungs (emphysema, etc.), as entail permanent shortness of breathing or a liability to attack of asthma. Further, whooping-cough is well known to be one of those diseases of early life which are apt to give rise to a weakened and vulnerable state of the general health, or to call into activity any inherited morbid tendency, such as that toward consumption.

As regards the treatment of whooping-cough in mild cases, little is necessary beyond keeping the patient warm and carefully attending to the general health. In mild weather the patient may be in the open air. In more severe forms efforts have to be employed to modify the severity of the paroxysms.

Onion syrup (made by macerating moist white sugar and chopped onions), into which a small proportion of syrup ipecac has been mixed is sometimes very efficient, care being taken that the bowels are not too much disturbed. Syrup tolu, oz. 2; ammonium chloride, gr. 30; fluid extract cannabis Indica, gtts. viii., form a good mixture for a child over five years of age; dose, teaspoonful three or four times a day. Opium in any form should be eschewed as it increases the congestion of the mucous membrane and thereby aggravates the cough. Bromide potassium in small doses is of benefit when there is much nervous disturbance, but should only be given under a physician's advice. Minute doses of largely diluted prussic acid are of benefit in assisting the secretions of the mucous membranes, and is probably best administered in the form of almond oil (*amygdalis amorenensis*); this remedy is, however, one which a physician alone should give. Generally speaking the disease is best left to run its own course, change of air often being the best remedy.

HOOPOE, a bird long celebrated in literature, and conspicuous by its variegated plumage and its large erectile crest, the *Upupa epops* of naturalists, which is the type of the very peculiar Family *Upupidae*, placed by Professor Huxley in his group *Coccygomorphæ*, but considered by Doctor Murie to deserve separate rank as *Epopomorphæ*. This species has an exceedingly wide range in the Old World, being a regular summer-visitant to the whole of Europe, in some parts of which it is abundant, as well as to Siberia, mostly retiring southward in autumn to winter in equatorial Africa and India, though it would seem to be resident throughout the year in Northeastern Africa and in China.

HOOORN, a town of Holland, at the head of an arrondissement in the province of North Holland, twenty miles north-northeast of Amsterdam, and ten miles southwest of Enkhuizen, with which it is connected by the road called De Streek. Population, 10,975.

HOOISIC FALLS, a manufacturing town of New York, lies on the Hoosic river, in Rensselaer county.

It has manufactories of agricultural machinery, iron, etc. It is a banking, railroad, and telegraph town, and has a population numbering (1900) 5,671.

HOP, *Humulus Lupulus*, L., the sole representative of its genus, an herbaceous twining plant, belonging to the natural order *Cannabaceæ*, which is by some botanists included in the larger group called *Urticaceæ* by Endlicher. It is of common occurrence in hedges and thickets in the southern counties of England, but is believed not to be native in Scotland. On the Continent it is distributed from Greece to Scandinavia, and extends through the Caucasus and Central Asia to the Altai Mountains. It is common, but doubtfully indigenous, in the northern and western States of North America, and has been introduced into Brazil, Australia, and the Himalayas.

It is a diocious perennial plant, producing annually several long twining roughish striated stems which twist from left to right, are often from fifteen to twenty feet long, and climb freely over hedges and bushes. The leaves are stalked, opposite, three-five lobed, and coarsely serrate, and bear a general resemblance to those of the vine, but are, as well as the whole plant, rough to the touch; the upper leaves are sometimes scarcely divided, or quite entire. The stipules are interpetiolar, each consisting of two lateral ones united, or rarely with the tips free. When fresh the gland is seen to be filled with a yellowish or dark brown liquid; this, on drying, contracts in bulk and forms a central mass. The contents of these glands, according to Lerner, are chiefly wax (myricylic palmitate) and resins, one of which is crystalline and unites with bases; with these the bitter acid of hops is present in small proportion. It is to these lupulinic glands that the medicinal properties of the hop are chiefly due.

The cultivation of hops for use in the manufacture of beer dates from an early period. In the eighth and ninth centuries hop gardens, called "humularia" or "humuleta," existed in France and Germany. In the herbarium of Apuleius (1050 A.D.), the hop ("hymele") is said to have been put in the usual drinks of England on account of its good qualities. Until the sixteenth century, however, hops appear to have been grown in a very fitful manner, and to a limited extent, generally only for private consumption; but after the commencement of the seventeenth century the cultivation increased rapidly. At the present time England produces a larger quantity than any other country in Europe.

Hops are cultivated in parts of New England, New York, Oregon, and Michigan, and most of the hops consumed in the United States are supplied by those districts. Although the hop was introduced into America nearly 250 years ago, and its cultivation encouraged by legislative enactments in 1657, it is only about seventy-five years since its culture was commenced on an extensive scale; but from that time the progress has been rapid, and hops have been grown in nearly every State in the Union. As in England, the hop is subject to disease and blight, and in consequence the crop is variable; thus, in 1869, 69,463 bales were exported from New York and none imported, and in 1873 only 315 bales were exported and 20,885 imported. The English cluster and grape hops seem to be most generally cultivated in New York and Wisconsin. Hops are also grown largely in Belgium, Prussia, France, Württemberg, and central Germany. In 1879 only 7,153 cwts. of hops were exported from England, chiefly to Australia and other British possessions, while 262,765 cwts. were imported, of which 108,306 cwts. were derived from the United States, 63,485 cwts. from Belgium, 50,567 from Germany, 26,796 from Holland, and smaller quantities from France and British North

AMERICA. The first packages of hops collected in England often fetch an extravagant price, and are sometimes disposed of with remarkable celerity. The first pocket (*sic*) of hops gathered in 1879 is said to have been picked, dried, sent to London, sold by auction, subjected to hydraulic pressure, packed and banded with iron, covered with three coats of paint, and dispatched to an Indian mail steamer—all within twenty-four hours. The better qualities are usually packed in fine and the inferior in coarse sacking. In Germany two varieties of the hop are distinguished, the August and the autumn hop, the former being preferred.

The stem of the hop abounds in fiber similar to that of hemp and flax, and has been used in Sweden in the production of a strong, durable white cloth. Hitherto it has been usual to steep the stem in water during the whole winter in order to separate the fiber easily. A much quicker process has, however, been patented, by which the fiber can be speedily extracted. This process consists in boiling the stems first for three-quarters of an hour in alkaline lye, and then, after rinsing in water, for the same time in acetic acid; the fiber is thus obtained in a state fit for bleaching. The leaves, stem, and root possess also an astringent property, and their use for tanning purposes was hence at one time patented in England. The leaves have also been recommended as fodder in the fresh state, mixed with other materials, and are said to increase the quantity and improve the quality of milk yielded by cows. The stems or "bine" are usually burned in the hop garden. The spent hops from breweries form excellent manure for light soils, and together with the leaves should be returned to the hop-gardens, the materials absorbed from the ground by the hop-plant being thus in some measure restored to it.

The use of hops in medicine dates from a very early period. Coles, in his *History of Plants* (1657), says: "They are good to cleanse the kidneys of gravel and provoke urine; they likewise open obstructions of the liver and spleen, and cleanse the blood and loosen the belly; and as they cleanse the blood, so consequently they help to cure eruptions of the skin." Brooke's *Dispensatory* (1753) recommends them also as an alterative, and as a remedy for hypochondriasis. Hops are officinal in the British and United States Pharmacopœias. According to Bartholow hops increase the action of the heart, excite the cutaneous circulation, and cause diaphoresis. A slight cerebral excitement is first produced, soon followed by a disposition to sleep. Hops also possess some anaphrodisiac properties. The preparations used are the tincture, infusion, and extract, the oleoresin, and the lupulinic glands. The drug is generally employed either as a stomachic in dyspepsia, or to allay nervous irritability or cerebral excitement in delirium tremens, where the use of opium is inadmissible. A combination of the tinctures of lupulin and capsicum is said to be one of the best substitutes for alcoholic stimulants when their habitual use is to be discontinued. A pillow stuffed with hops forms a well-known domestic remedy for sleeplessness, and a bag of hops dipped in hot water is often used as an external application to relieve pain or inflammation, especially of the abdominal organs.

HOPE, THOMAS, the author of *Anastasis*, born at London about 1770, was descended from a branch of an old Scotch family who for several generations were extensive merchants in London and Amsterdam. Hope died February 3, 1831. He was the author of two works published posthumously,—the *Origin and Prospects of Man*, 1831, in which he indulged in speculations diverging widely from the usual orthodox opinions, and an *Historical Essay on Architecture*, 1835, an

elaborate description of the architecture of the Middle Ages, illustrated by drawings made by himself in Italy and Germany.

HÔPITAL. See L'HÔPITAL.

HOPKINS, EZEKIEL, bishop of Londonderry, and a Calvinistic divine of some repute, was born at Stanford, Devon, in 1633. He died in June, 1690.

HOPKINS, SAMUEL, the theologian from whom the Hopkinsians or Hopkinsian Calvinists take their name, was born at Waterbury, Conn., on September 17, 1721.

While in vigor of intellect and in strength and purity of moral tone hardly inferior to Jonathan Edwards, Hopkins considerably excelled his master in force and energy of character. To him belongs the honor of having been one of the first to stir up and organize political action against slavery; and to his persistent though bitterly opposed efforts are chiefly to be attributed the law of 1774, which forbade the importation of negroes into New England, as also that of 1784, which declared that all children of slaves born after the following March should be free. He was the author of numerous pamphlets, addresses and sermons; and he also published lives of Jonathan Edwards, Susannah Anthony and Mrs. Osborn. But his distinctive theological tenets are chiefly to be sought in his important work, the *System of Theology*, which, published in 1791, has had an influence hardly inferior to that exercised by the writings of Edwards himself. He died in 1803.

HOPKINSON, FRANCIS, an American author, and one of the signers of the Declaration of Independence, was born at Philadelphia in 1737. He studied at the college of Philadelphia, and after graduating in 1763, resolved to prepare himself for the legal profession. After being admitted to the bar in 1765, he spent two years in England, and on his return in 1768 he obtained a lucrative public appointment in New Jersey. In 1776-77 he represented that State in Congress. In 1779 he was appointed judge of admiralty for Pennsylvania, and in 1790 district judge for the same State. He died at Philadelphia, May 9, 1791. Hopkinson was the author of several songs to which he wrote popular airs, and of various political poems, pamphlets and *jeux d'esprit*, which from their humorous satire had a wide circulation, and powerfully assisted in arousing and fostering the spirit of political independence that issued in the American Revolution.

HOPKINSVILLE, the county seat of Christian county, Ky., lies on the Little River. It has manufacturing, banks, stores, churches, hotels, a court house and an insane asylum for the State. There are two female and one male colleges here. The town has several newspapers. Population (1900 census), 7,280. It is a railroad and telegraph station.

HOPPNER, JOHN, English portrait painter, was born on April 4, 1758, and died in 1810.

HOR, MOUNT, a lofty and conspicuous double-topped mountain in Arabia Petraea, forming part of the great Jurassic chain of Shera or Seir. It stands on the eastern edge of the great valley of the Arabah, which extends from the head of the Gulf of Akabah to the valley of the Jordan, and it is referred to in Scripture as "on the border," or "at the edge" of the land of Edom.

HORACE, (65-8 B.C.) No ancient writer has been at once so familiarly known and so generally appreciated in modern times as Quintus Horatius Flaccus. We seem to know his tastes and habits, and almost to catch the tones of his conversation, from his own works, as we know the character and manner of Doctor Johnson from the pages of Boswell. His twofold function of a satiric moralist and a lyric poet gave a

peculiar value, both to his self-portraiture and to the impressions which he has left of his age. From his *Satires*, which deal chiefly with the manners and outward lives of men, we know him in his relations to society and his ordinary moods; from his *Epistles*, which deal more with the inner life, we best understand his deepest convictions and the practical side of his philosophy; while his *Odes* have perpetuated the finest pleasure which he derived from art, nature, and the intercourse of life, have idealized some of the graver as well as the lighter aspects of his reflection, and given an elevated expression to his sympathy with the national ideas and movement of his time.

His own writings afford much the fullest and most trustworthy materials for his biography and for the estimate of his character. But a few facts, in addition to those recorded by the poet himself, are known from the short life originally contained in the work of Suetonius, *De Viris Illustribus*.

Horace was born December 8, 65 B.C., in the consulship of L. Manlius Torquatus and L. Aurelius Cotta. His birthplace was the town of Venusia on the borders of Lucania and Apulia, whence he describes himself as "Lucanus an Apulus aniceps." His father was a freedman by position; and it is supposed that he had been originally a slave of the town of Venusia, and on his emancipation had received the gentile name of Horatius from the Horatian tribe in which the inhabitants of Venusia were enrolled. After his emancipation he acquired by the occupation of "coactor" sufficient means to enable him to buy a small farm, to make sufficient provision for the future of his son, and to take him to Rome to give him the advantage of the best education there. After the ordinary grammatical and literary training at Rome, Horace went to Athens, the most famous school of philosophy, as Rhodes was of oratory; and he describes himself while there as "searching after truth among the groves of the Academy" as well as advancing in literary accomplishment. His pleasant residence there was interrupted by the breaking out of the civil war. Following the example of his young associates, he attached himself to the cause of Brutus, whom he seems to have accompanied to Asia, probably as a member of his staff; and he served at the battle of Philippi in the post of military tribune. He shared the rout which followed the battle, and in an ode addressed to his old comrade Pompeius Grosphus he alludes, in imitation of a similar confession of Alceus, to the inglorious casting away of his shield. In interpreting such passages in the works of Horace, we have always to bear in mind the irony habitual to him, and the reserve imposed on him by his subsequent relations to the chiefs of the victorious party.

He returned to Rome shortly after the battle, stripped of his property, which formed part of the land confiscated for the benefit of the soldiers of Octavianus and Antony. It may have been at this time that he encountered the danger of shipwreck, which he mentions among the perils from which his life had been protected by supernatural aid. He procured in some way the post of a clerkship in the quaestor's office, and about three years after the battle of Philippi, he was introduced by Virgil and Varius to Mæcenas. This was the turning-point of his fortunes. He owed his friendship with the greatest of literary patrons to his personal merits rather than to his poetic fame; for, though some of his shorter and less important pieces may have been known to a small circle of friends before the date of this introduction, his first published work shows that the relations of intimacy and mutual confidence which were never afterward disturbed had been established between the statesman and poet some time before this book was given to the world.

About a year after the publication of this first book of *Satires* Mæcenas presented him with a farm among the Sabine hills, in the valley crowned by Mount Lucretius and watered by the stream Digentia, which joins the main valley of the Anio near the modern Vico Varo, and about eight miles above the modern Tivoli. No kind of gift could have added more to the poet's happiness or exercised a more salutary influence on his genius.

The second book of *Satires* was published in 29 B.C., the *Epodes* apparently about a year earlier, though many of them are, as regards the date of their composition, to be ranked among the earliest extant writings of Horace. Horace speaks of them under the name of "iambi." In one of his *Epistles* he rests his first claim to originality on his having introduced into Latin the meters and spirit of Archilochus—

"Parios ego primus iambos
Ostendi Latîo, numeros animosque secutus
Archilochi."

The *Epodes* are chiefly interesting as a record of the personal feelings of Horace during the years which immediately followed his return to Rome, and as a prelude to the higher art and inspiration of the first three books of the *Odes*, which were published together about the end of 24 or the beginning of 23 B.C.

About four years after the publication of the three books of *Odes*, the first book of the *Epistles* appeared, introduced, as his *Epodes*, *Satires* and *Odes* had been, by a special address to Mæcenas. From these *Epistles*, as compared with the *Satires*, we gather that he had gradually adopted a more retired and meditative life, and had become fonder of the country and of study, and that, while owing allegiance to no school or sect of philosophy, he was framing for himself a scheme of life, was endeavoring to conform to it, and was bent on inculcating it on others. He maintained his old friendships, and continued to form new intimacies, especially with younger men engaged in public affairs or animated by literary ambition. After the death of Virgil he was recognized as preëminently the greatest living poet and was accordingly called upon by Augustus to compose the sacred hymn for the celebration of the secular games in 17 B.C. About four years later he published the fourth book of *Odes*, having been called upon to do so by the emperor, in order that the victories of his stepsons Drusus and Tiberius over the Rhæti and Vindelici might be worthily celebrated. He lived about five years longer, and during these years published the second book of *Epistles*, and the *Epistle to the Pisos*, more generally known as the "*Ars Poetica*." These later *Epistles* are mainly devoted to literary criticism, with the especial object of vindicating the poetic claims of his own age over those of the age of Ennius and the other poets of Rome. He might have been expected, as a great critic and lawgiver on literature, to have exercised a beneficial influence on the future poetry of his country, and to have applied as much wisdom to the theory of his own art as that of a right life. But his critical *Epistles* are chiefly devoted to a controversial attack on the older writers and to the exposition of the laws of dramatic poetry, on which his own powers had never been exercised, and for which either the genius or circumstances of the Romans were unsuited. The same subordination of imagination and enthusiasm to good sense and sober judgment characterizes his opinions on poetry as on morals.

He died somewhat suddenly in the November of the year 8 B.C., within a few weeks of the death of Mæcenas, thus strangely confirming the declaration made by him in one of his *Odes*. Though not an old man, he had reached the full maturity of his faculties, and fully

accomplished the work he was fitted to do in the world. He lived longer than any of the illustrious poets immediately contemporary with him or belonging to the preceding generation; and his works show a mature character and a mellow wisdom in striking contrast to the tone of the only other great lyrical poet of Rome, "the young Catullus."

HORATII, three brothers born at one birth, who were the champions of Rome in the war against Alba Longa. Three Alban brothers named the Curiatii, likewise born at one birth, were opposed to them. The mothers were also twin sisters, who had been married at the same time, and had given birth to their sons on one day. When the Alban army under their king Cluilius lay encamped some miles from Rome, Tullus Hostilius, the Roman king, agreed with them that the issue should depend on the combat between the two families. Two of the Horatii were soon slain; the third brother feigned flight, and when the Curiatii, who were all wounded, pursued him without concert he turned and slew them one by one. Now the sister of the Horatii was engaged to one of the Curiatii, and had made for him a beautiful mantle. When the victor, adorned with this trophy, was entering Rome in triumph, his sister came to greet him by the Porta Capena; but when the fatal mantle, which he wore as a trophy, showed her that her lover had fallen by her brother's hand, she invoked a curse on him. Enraged at her reproaches, he slew her on the spot; and the body of her that had preferred her lover to her country lay unburied till passers-by covered it with stones. Horatius was condemned by *duumviri*, specially appointed as his judges, to be scourged to death; but his father justified his action, and on appeal the people spared his life, condemning him in penalty to walk with veiled head below the *sororium tigillum*. Horatius was afterward sent to destroy Alba Longa and transport all the inhabitants to Rome. Monuments of the tragic tale were shown by the Romans in the time of Livy—the *pila Horatia* in the forum, where the victor hung his spoils; the beam under which the brother passed, and which stood across a narrow street near the site of the later Flavian Amphitheater; the sister's grave outside the gate; the grave of the two Horatii, and those of the three Curiatii, where each had fallen; the *fossa Cluilia* dug by the Albans to defend their camp.

HORDE, a manufacturing town of Westphalia, Prussia, circle of Dortmund, government district of Arnsberg, is situated on the railway from Dortmund to Soest, two miles southeast from Dortmund.

HOREB, another name for **SINAI**, *q. v.*

HOREHOUND, *Marrubium*, L., a genus of perennial, usually cottony or woolly herbs, of the natural order *Labiatae*, and tribe *Stachydeæ*. Common or white horehound, *M. vulgare*, L., has a short and stout root-stock, and thick stems, about a foot in height, which, as well as their numerous branches, are coated with a white or hoary felt—whence the popular name of the plant. White horehound contains a volatile oil, resin, a crystallizable bitter principle termed *marrubiin*, and other substances, and has a not unpleasant aromatic odor, and a persistent bitter taste. It possesses expectorant, tonic, and carminative properties, and in large doses is diuretic and laxative; and the infusion, syrup, or confection of horehound has long been in repute for the treatment of coughs and asthma, and has been recommended also in phthisis, chronic rheumatism, hepatic and uterine disorders, hysteria, and chlorosis. For medicinal purposes the plant should be gathered when in flower, and is preferable in the fresh condition.

HORGEN, a village in the Swiss canton of Zurich,

capital of the district of Horgen, is situated on the left bank of the Zurich Lake, 1,500 feet above sea-level, and nine miles south of Zurich.

HORITZ, a town of Bohemia, Austria, government district of Königgrätz, is situated on the right bank of the Bistritz, ten miles northeast from Bidschow.

HORMAYR, JOSEPH, BARON VON, German statesman and historian, was born at Innsbruck, January 20, 1781, and died at Munich, November 5, 1848.

HORMISDAS, pope from 514–523, in succession to Symmachus, was a native of Campania. He was succeeded in 523 by John I. Eighty of his letters are preserved in Labbe's *Sacrosancta Concilia*, vol. v. (1728), and are also to be found in vol. lxiii. of Migne's *Patrologie Coursus Completus* (Latin series).

HORN. The weapons which project from the heads of various species of animals, constituting what are known as horns, embrace substances which are, in their anatomical structure and chemical composition, quite distinct from each other; and although in commerce also they are known indiscriminately as horn, their uses are altogether dissimilar. These differences in structure and properties are thus indicated by Professor Owen:—"The weapons to which the term horn is properly or technically applied consist of very different substances, and belong to two organic systems, as distinct from each other as both are from the teeth. Thus the horns of deer consist of bone, and are processes of the frontal bone; those of the giraffe are independent bones or 'epiphyses' covered by hairy skin; those of oxen, sheep and antelopes are 'apophyses' of the frontal bone, covered by the corium and by a sheath of true horny material; those of the prong-horned antelope consist at their basis of bony processes covered by hairy skin, and are covered by horny sheaths in the rest of their extent. They thus combine the character of those of the giraffe and ordinary antelope, together with the expanded and branched form of the antlers of deers. Only the horns of the rhinoceros are composed wholly of horny matter, and this is disposed in longitudinal fibers, so that the horns seem rather to consist of coarse bristles compactly matted together in the form of a more or less elongated sub-compressed cone." True horny matter is really a modified form of epidermic tissue, and consists of an albuminoid principle termed "keratin." It forms, not only the horns of the ox tribe, but also the hoofs, claws or nails of animals generally, the carapace of the tortoises and the armadilloes, the scales of the pangolin, porcupine quills, and birds' feathers, etc.

HORN, or **FRENCH HORN**, a wind instrument made at various times of various materials such as wood, ivory and several metals, but belonging in its modern significance to the class of brass instruments. The notes natural to the horn and produced by the action of the lips alone are the so-called harmonics or partial tones of the bottom note between the extreme limits of the C below the staff in the base clef to the E in alt. Some of these notes are, however, not used in practice. In order to supply the notes not in the scale of natural harmonics various methods have been used. The simplest is the insertion of the hand in the bell of the instrument, accidentally discovered by a German horn-player toward the end of the last century. The effect is to lower the note by a semitone or a whole tone, according to the extent that the orifice is closed. The drawback attaching to this system is that the "closed" or "stopped" (*étouffé*) notes differ in character from the open ones, and are in part dull. It is true that a good composer may produce certain effects by this means. In the modern horn a mechanical contrivance generally takes the place of the hand. This is the valve or vent, an apparatus for lowering the note by means of the

pressure of the fingers. There are three valves attached to the vent-horn, lowering the note by one, two and three semitones respectively. Most modern composers write for the vent-horn exclusively; others use it in combination with natural or hand horns. Another important appliance of the horn is the crook, which may best be described as a transposing machine. The crooks can be removed at will, their effect (by altering the length of the tube) being to transpose the notes produced by the lips into anything that is required. The player therefore plays as it were in one and the same key, and the difficulty of transposing his part mentally is saved to him. In consequence the horn part in a score is always written in the key of C, which may be changed into E flat or F or E by merely inserting the crook intended for that key. In this way not only the diatonic scale, but all kinds of chromatic progressions can be produced on the horn.

HORNBEAM, a small genus of trees of the natural order *Cupulifera* and sub-order *Corylee*. The Latin name *Carpinus* has been thought to be derived from the Celtic *car*, wood, and *pin* or *pen*, head, the wood of hornbeams having been used for yokes of cattle. The common hornbeam, or yoke-elm, is indigenous in the temperate parts of western Asia and of Asia Minor, and in Europe where it ranges as high as 55° and 56° N. latitude. It is common in woods and hedges in parts of Wales and of the south of England. The trunk is usually flattened, and twisted as though composed of several stems united; the bark is smooth, and light gray; and the leaves are subdistichous, two to three inches long, elliptic-ovate, doubly serrate, pointed, numerous ribbed, hairy below, and opaque, and not glossy as in the beech, have large stipules and short petioles, and when young are plaited. The flowers appear with the leaves in April and May.

The wood of the hornbeam is white and close-grained, and polishes ill, is of considerable tenacity and little flexibility, and is extremely tough and hard to work — whence, according to Gerard, the name of the tree.

HORNBILL, the English name for a long while generally given to all the birds of the Family *Bucerotidae* of modern ornithologists, from the extraordinary horn-like excrescence (*epithema*) developed on the bill of most of the species, though to which of them it was first applied seems doubtful. Among classical authors Pliny had heard of such animals, and mentions them under the name of *Tragopan*; but he deemed their existence fabulous, comparing them with *Pegasi* and *Gryphones* — in the words of Holland, his translator — “I think the same of the Tragopanades, which many men affirm to be greater than the *Ægle*; having crooked horns like a Ram on either side of the head, of the colour of yron, and the head onely red.”

HORNBOOK, a name sometimes given to an elementary treatise on any subject. It was originally applied to a sheet containing the letters of the alphabet, which formed a primer for the use of children. It was mounted on wood and protected with transparent horn. Sometimes the leaf was simply pasted against the slice of horn. The wooden frame had a handle, and it was usually hung at the child's girdle.

HORNCastle, a market-town giving its name to a soke in Lincolnshire, England, is situated at the foot of a line of low hills called the Wolds, on an angle formed by the confluence of the Bain and Waring, and at the terminus of a branch line of the Great Northern Railway. Population, 5,875.

HORNE, GEORGE, bishop of Norwich, was born on November 1, 1730, at Otham near Maidstone. As a preacher he early attained great popularity; and his reputation was further helped by several clever if some-

what wrong-headed publications, including a satirical pamphlet entitled *The Theology and Philosophy of Cicero's Somnium Scipionis* (1751), a defense of the Hutchinsonians in *A Fair, Candid, and Impartial State of the Case between Sir Isaac Newton and Mr. Hutchinson* (1753), and critiques upon Doctor Shuckford (1754) and Doctor Kennicott (1760). He died at Bath, January 17, 1792.

HORNE, THOMAS HARTWELL, a well-known writer on Biblical introduction, was born in London on October 20, 1780, and from 1789–95 was educated at Christ's Hospital, where Coleridge was an elder contemporary. He died in London on January 26, 1862.

HORNELLSVILLE, a New York town, lies in Steuben county, on the Canisteo river. It has manufactures of agricultural implements, shoes, boots, leather, etc. There are schools, churches, newspapers, a free high school and a business college here. It is a banking, railroad, and telegraph town, and has a public library and a Catholic convent. Extensive railroad repair shops are also situated here. Population (1900), 11,918.

HORNER, FRANCIS, political economist, was born at Edinburgh, August 12, 1778. He died at Pisa, February 8, 1817. He was buried at Leghorn, and a marble statue by Chantrey was erected to his memory in Westminster Abbey.

HORNET. See WASP.

HORNPIPE was originally the name of an instrument no longer in existence, and is now used for an English national dance. The sailor's hornpipe, although the most common, is by no means the only form of the dance, for there is a pretty tune known as the “College Hornpipe,” and other specimens of a similar kind might be cited. The composition of hornpipes flourished chiefly in the last century, and even Handel did not disdain to use the characteristic rhythm. The hornpipe may be written in $\frac{3}{4}$ or in common time, and is always of a lively nature.

HORROCKS, JEREMIAH, an astronomer of extraordinary promise, blighted by a premature death, was born in 1619, at Toxteth Park, near Liverpool. His university career lasted three years, and on his return to Lancashire he devoted to astronomical observations the brief intervals of leisure snatched from the harassing occupations of a laborious life. In 1636 he met with a congenial spirit in William Crabtree, a draper of Broughton, near Manchester; and encouraged by his advice he exchanged the guidance of Lansberg, a pretentious but inaccurate Belgian astronomer, for that of Kepler. He now set himself to the revision of the Rudolphine Tables (published by Kepler in 1627), and in the progress of his task became convinced that a transit of Venus overlooked by Kepler, would, nevertheless, occur on November 24 (O.S.), 1639. He was at this time curate at Hoole, near Preston, having recently taken orders in the Church of England, although, according to the received accounts, he had not attained the canonical age. November 24th falling on a Sunday, his clerical duties threatened fatally to clash with his astronomical observations; he was, however, released just in time to witness the punctual verification of his forecast, and carefully noted the progress of the phenomenon during half an hour before sunset (3:15 to 3:45). This transit of Venus is remarkable as the first ever observed, that of 1631, predicted by Kepler, having been invisible in Europe. Notwithstanding the rude character of the apparatus at his disposal, Horrocks was enabled by his observation of it to introduce some important corrections into the elements of the planet's orbit, and to reduce to its exact value the received estimate of its apparent diameter.

After a year spent at Hoole, he returned to Toxteth.

and there, on the eve of a long-promised visit to his friend, Crabtree, unexpectedly expired, January 3, 1641, in the twenty-second year of his age.

HORSE. The horse and its near allies, the several species of asses and zebras, constitute the genus *Equus* of Linneus, a small group of animals of the class *Mammalia*, so distinct in their organization from all other existing members of the class that in many of the older zoölogical systems they were placed in an order apart, under the name of *Solidungula* or *Monodactyla*.

The remains of the earliest known animals to which it is possible to trace back the modern horse by a series of successive modifications are found in the lowest strata of the great lacustrine formations assigned to the Eocene period, spread over considerable portions of the present territories of New Mexico, Wyoming, and Utah in North America. That similar animals may have existed in other parts of the world is extremely probable.

Fossil remains of true horses, differing but very slightly from the smaller and inferior breeds of those now existing, are found abundantly in deposits of the most recent geological age, in almost every part of America, from Escholz Bay in the north to Patagonia in the south. In that continent, however, they became quite extinct, and no horses, either wild or domesticated, existed there at the time of the Spanish conquest, which is the more remarkable as, when introduced from Europe, the horses that ran wild proved by their rapid multiplication in the plains of South America and Texas that the climate, food, and other circumstances were highly favorable for their existence. The former great abundance of *Equidae* in America, their complete extinction, and their perfect acclimatization when reintroduced by man, form curious but as yet unsolved problems in geographical distribution.

The existing species of the genus *Equus* are the following:

(1.) The Horse, *Equus caballus*, Linn., is distinguished from the others by the long hairs of the tail being more abundant and growing quite from the base as well as the end and sides, and also by possessing a small bare callosity on the inner side of the hind leg, just below the "hock" or heel joint, in addition to the one on the inner side of the forearm above the carpus, common to all the genus. The mane is also longer and more flowing, and the ears shorter, the limbs longer, and the head smaller.

Though the existing horses are usually not marked in any definite manner, or only irregularly dappled or spotted with light surrounded by a darker ring, many examples are met with showing a dark median dorsal streak like that found in all other members of the genus, and even with dark stripes on the shoulders and legs indicating "the probability of the descent of all the existing races from a single dun-colored, more or less striped, primitive stock, to which our horses still occasionally revert."

In Europe wild horses were extremely abundant in the Neolithic or polished-stone period. Judging from the quantity of their remains found associated with those of the men of that time, the chase of these animals must have been among his chief occupations, and they must have furnished him with one of his most important food supplies. The characters of the bones preserved, and certain rude but graphic representations carved on bones or reindeer's antlers, enable us to know that they were rather small in size, and heavy in build, with large heads and rough and shaggy manes and tails, much like, in fact, the present wild horses of the steppes of the south of Russia. These horses were domesticated by the inhabitants of Europe before the dawn of history, but it is doubtful whether the majority of the animals

now existing on the Continent are derived directly from them, as it is more probable that they are descendants from horses imported through Greece and Italy from Asia, derived from a still earlier domestication, followed by gradual improvement through long-continued attention bestowed on their breeding and training. Horses are now diffused by the agency of man throughout almost the whole of the inhabited parts of the globe, and the great modifications they have undergone in consequence of domestication and selective breeding are well exemplified by comparing such extreme forms as the Shetland pony, dwarfed by congenial climate, the thoroughbred racer, and the dray-horse. In Australia, as in America, horses imported by the European settlers have escaped into the unclaimed lands, and multiplied to a prodigious extent, roaming in vast herds over the plains where no hoofed animal ever trod before.

(2.) *Equus asinus*, Linn.—The Domestic Ass is nearly as widely diffused and useful to man as the horse. It was known in Egypt long before the horse, and is probably of African origin, indeed its close resemblance to the existing wild ass of Abyssinia, *E. læniopus*, Heuglin, leaves little doubt as to its identity with that species.

(3.) The Asiatic Wild Asses, which roam in small herds in the open plains of Syria, of many parts of Persia, of the northwest of India, and the highlands of Tartary and Tibet from the shores of the Caspian to the frontiers of China, differ from the last in being of a more rufous or isabelline color, instead of pure gray, in wanting the dark streak across the shoulder, and having smaller ears. They have all a dark-colored median dorsal stripe. Though it is considered probable by many zoölogists that they form but a single species, they present such marked variations in size and form that they have commonly been divided into three—the Syrian Wild Ass, the Onager from Persia, the Punjab, Scinde and the desert of Cutch, and the Kiang or Dzeggetai of the high table-lands of Tibet, where it is usually met with at an elevation of 15,000 feet and upward above the sea-level. The last is considerably larger than either of the others, and differs from them in external appearance, having more the aspect of the horse. They are all remarkably swift, having been known to outstrip the fleetest horse in speed.

Lastly, there are three striped species, all inhabitants of South Africa. These constitute the genus *Hippotigris* of Hamilton Smith, but they are not separable except by their coloration from the true asses, and one of them (4), the Quagga, may be considered as intermediate. This animal has the dark stripes limited to the head, neck and shoulders, upon a brown ground. In (5) the Dauw or Burchell's Zebra, the ground color is white, and the stripes cover the body and upper part of the limbs. This is the commonest species in the great plains of South Africa, where it roams in large herds, often in company with the quagga and numerous species of antelope. It ranges from the Orange River to the confines of Abyssinia. In (6) the Mountain Zebra the contrast between the clear white of the ground and the black of the stripes is most marked, and the latter extend quite down to the hoofs. This is, consequently, the most beautiful species of the group as regards color, if the horse may bear the palm in elegance of form. It frequents mountainous districts rather than the open plains which are the dwelling-places of the other two species, and as it appears to be limited to the southern portion of the continent, within the confines of the Cape Colony, its members are rapidly diminishing under the encroachments of European civilization.

There are thus at least six modifications of the horse

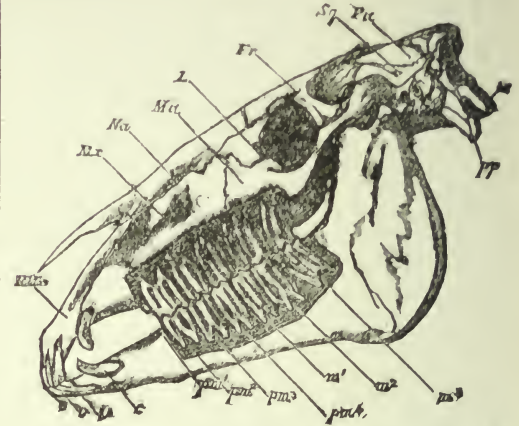
type at present existing, sufficiently distinct to be reckoned as species by all zoölogists, and easily recognized by their external characters. They are, however, all so closely allied that each will, at least in a state of domestication or captivity, breed with perfect freedom with any of the others. Cases of fertile union are recorded between the horse and the quagga, the horse and the dauw or Burchell's zebra, the horse and the hemionus or Asiatic wild ass, the common ass and the zebra, the common ass and the dauw, the common ass and the hemionus, the hemionus and the zebra, and the hemionus and the dauw. The two species which are perhaps the farthest removed in general structure, the horse and the ass, produce, as is well known, hybrids or mules, which in some qualities useful to man excel both their progenitors, and in some countries and for certain kinds of work are in greater requisition than either. Although occasional instances have been recorded of female mules breeding with the males of one or other of the pure species, it is doubtful if any case has occurred of their breeding *inter se*, although the opportunities of doing so must have been great, as mules have been reared in immense numbers for at least several thousands of years. We may therefore consider it settled that the different species of the group are now in that degree of physiological differentiation which enables them to produce offspring with each other, but does not permit of the progeny continuing the race, at all events unless reinforced by the aid of one of the pure forms.

The several members of the group show mental differences quite as striking as those exhibited by their external form, and more than perhaps might be expected from the similarity of their cerebral organization. The patience of the ass, the high spirit of the horse, the obstinacy of the mule, have long been proverbial. It is very remarkable that, out of so many species, two only should have shown any aptitude for domestication, and that these two should have been from time immemorial the universal and most useful companions and servants of man, while all the others remain in their native freedom to this day. It is, however, still a question whether this really arises from a different mental constitution causing a natural capacity for entering into relations with man, or whether it may not be owing to their having been brought gradually into this condition by long continued and persevering efforts when the need of their services was keenly felt. It is quite possible that one reason why most of the attempts to add new species to the list of our domestic animals in modern times have ended in failure is that it does not answer to do so in cases in which existing species supply all the principal purposes to which the new ones might be put. It can hardly be expected that zebras and quaggas fresh from their native mountains and plains can be brought into competition as beasts of burden and draught with horses and asses, whose naturally useful qualities have been augmented by the training of thousands of generations of progenitors.

Not infrequently instances occur of domestic horses being produced with a small additional toe with complete hoof, usually on the inside of the principal toe, and, though far more rarely, three or more toes may be present. These malformations are often cited as instances of reversion to the condition of some of the earlier forms of equine animals previously mentioned. Such explanations, however plausible they appear at first sight, are nevertheless very doubtful. All the feet of polydactyle horses which we have examined bear little resemblance to those of the extinct *Hipparion* or *Anchitherium*, but look rather as if due to that tendency to reduplication of parts which occurs so frequently as a teratological condition, especially among domestic

animals, and which, whatever its origin, certainly cannot in many instances, as the case of entire limbs super-added, or of six digits in man, be attributed to reversion.

Skeleton.—The skull as a whole is greatly elongated, chiefly in consequence of the immense size of the face as compared with the hinder or true cranial portion. The formation of the skull is best seen in accompanying illustration.



Side view of skull of horse, with the bone removed so as to expose the whole of the teeth. *PMx*, premaxilla; *Mx*, maxilla; *Na*, nasal bone; *Ma*, malar bone; *L*, lacrimal bone; *Fr*, frontal bone; *Sq*, squamosal bone; *Pa*, parietal bone; *oc*, occipital condyle; *pb*, paroccipital process; *i1*, *i2*, and *i3*, the three incisor teeth; *c*, the canine tooth; *pm1*, the situation of the rudimentary first premolar, which has been lost in the lower, but is present in the upper jaw; *pm2*, *pm3*, and *pm4*, the three fully-developed premolar teeth; *m1*, *m2*, and *m3*, the three true molar teeth.

The vertebral column consists of seven cervical, eighteen dorsal, six lumbar, five sacral, and fifteen to eighteen caudal vertebrae. There may be nineteen rib-bearing vertebrae, in which case five only will be reckoned as belonging to the lumbar series. The odontoid process of the atlas is wide, flat and hollowed above, as in the ruminants. The bodies of the cervical vertebrae are elongated, strongly keeled, and markedly opisthocœlous, or concave behind and convex in front. The neural laminae are very broad, the spines almost obsolete, except in the seventh, and the transverse processes not largely developed. In the trunk vertebrae the opisthocœlous character of the centrum gradually diminishes. The spinous processes of the anterior thoracic region are high and compressed. To these is attached the powerful elastic ligament, *ligamentum nuchæ*, or "paxwax," which, passing forward in the middle line of the neck above the neural arches of the cervical vertebrae, to which it is also connected, is attached to the occiput and supports the weight of the head. The transverse processes of the lumbar vertebrae are long, flattened, and project horizontally outward or slightly forward from the arch. The metapophyses are moderately developed, and there are no anapophyses. The caudal vertebrae, except those quite at the base, are slender and cylindrical without processes and without chevron bones beneath. The ribs are eighteen or nineteen in number on each side, flattened, and united to the sternum by short, stout, tolerably well ossified sternal ribs. The sternum consists of six pieces; the anterior or præsternum is extremely compressed, and projects forward like the prow of a boat. The segments which follow gradually widen, and the hinder part of the sternum is broad and flat.

As in all other ungulates, there are no clavicles. The scapula is long and slender; the supra-scapular border is rounded, and slowly and imperfectly ossified. The spine is very slightly developed; rather above the middle its edge is thickened and somewhat turned backward, but it gradually subsides at the lower extremity without forming any acromial process. The coracoid is a prominent rounded nodule. The humerus is stout and rather short. The ulna is quite rudimentary, being only represented by little more than the olecranon. The shaft gradually tapers below and is firmly ankylosed to the radius. The latter bone is of nearly equal width throughout. The three bones of the first row of the carpus (the scaphoid, lunar, and cuneiform) are subequal in size. The second row consists of a very broad and flat magnum, supporting the great third metacarpal, having to its radial side the trapezoid, and to its ulnar side the unciform, which are both small, and articulate distally with the rudimentary second and fourth metacarpals. The pisiform is large and prominent, flattened, and curved; its articulates partly with the cuneiform and partly with the lower end of the radius. The large metacarpal is called in veterinary anatomy "cannon bone;" the small lateral metacarpals, which gradually taper toward their lower extremities and lie in close contact with the large one, are called "splint bones." The single digit consists of a moderate-sized proximal (*os suffraginis*, or large pastern), a very short middle (*os coronee*, or small pastern), and a wide, semi-lunar, ungual phalanx (*os pedis*, or coffin bone.) There is a pair of large nodular sesamoids behind the metacarpo-phalangeal articulation, and a single large transversely-extended sesamoid behind the joint between the second and third phalanx, called the "navicular bone."

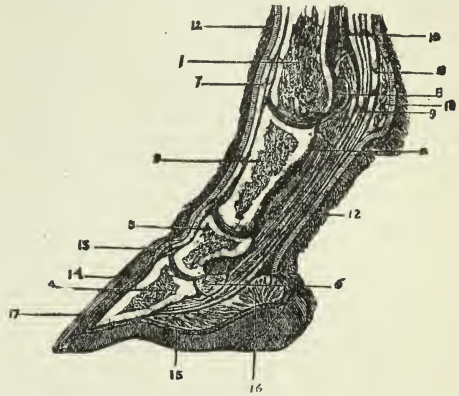
The carpal joint, corresponding to the wrist of man, is commonly called the "knee" of the horse, the joint between the metacarpal and the first phalanx the "fetlock," that between the first and second phalanges the "pastern," and that between the second and third phalanges the "coffin joint."

In the hinder limb the femur is marked, as in all other known perissodactyles, by the presence of a "third trochanter," a flattened process, curving forward, arising from the outer side of the bone, about one-third of the distance from the upper end. The fibula is reduced to a mere styliform rudiment of the upper end. The lower part is absent or completely fused with the tibia. The os calcis has a long and compressed calcareous process. The astragalus has a large flat articular surface in front for the navicular, and a very small one for the cuboid. The navicular and the external cuneiform bones are very broad and flat. The cuboid is small, and the internal and middle cuneiform bones are small and united together. The metapodals and phalanges resemble very closely those of the fore limb, but the principal metatarsal is more laterally compressed at its upper end than is the corresponding metacarpal. The joint between the femur and tibia, corresponding to the knee of man, is called the "stifle joint;" that between the tibia and tarsus, corresponding to the ankle of man, is called the "hock." The bones and joints of the foot have the same names as in the fore limb. The horse is eminently "digitigrade," standing on the extremity of the single digit of each foot, which is kept habitually in a position approaching to vertical.

The muscles of the limbs are modified from those of the ordinary mammalian type in accordance with the reduced condition of the bones and the simple requirements of flexion and extension of the joints, no such actions as pronation and supination, or opposition of digits, being possible or needed. The muscles therefore

which perform these functions in other quadrupeds are absent or rudimentary.

Below the carpal and tarsal joints, the fore and hind limbs correspond almost exactly in structure as well as function. On the anterior or extensor surface of the limb a powerful tendon, that of the anterior extensor of the phalanges (corresponding to the *extensor communis*



Section of foot of horse. 1, metacarpal bone; 2, first phalanx (*os suffraginis*); 3, second phalanx (*os coronee*); 4, third or ungual phalanx (*os pedis*, or coffin bone); 5, one of the upper sesamoid bones; 6, lower sesamoid or navicular bone; 7, tendon of anterior extensor of the phalanges; 8, tendon of superficial flexor (*flexor perforatus*); 9, tendon of deep flexor (*flexor profundus*); 10, suspensory ligament of fetlock; 11, inferior or short sesamoid ligament; 12, derma or skin of the foot, covered with hair, and continued into 13, the coronary cushion, 14, the podophyllous or laminar membrane, and 15, the keratogenous membrane of the sole; 16, plantar cushion; 17, hoof; 18, fatty cushion of fetlock.

digitorum of the arm and *extensor longus digitorum* of the foot of man) passes down over the metacarpal bone and phalanges, to be inserted mainly into the upper edge of the anterior surface of the last phalanx or pedal bone. There is also a much smaller second extensor on the outer side of this in each limb, the lateral extensor of the phalanges. In the foreleg the tendon of this muscle (which corresponds with the *extensor minimi digiti* of man) receives a slip from that of the principal extensor, and is inserted into the first phalanx. In the hind leg (where it is the homologue apparently of the *peroneus brevis* of man) the tendon becomes blended with that of the large extensor.

A very strong ligamentous band behind the metapodium, arising from near the upper extremity of its posterior surface, divides into two at its lower end, and each division, being first connected with one of the paired upper sesamoid bones, passes by the side of the first phalanx to join the extensor tendon of the phalanges. This is called in veterinary anatomy the "suspensory ligament of the sesamoids," or of the "fetlock;" but its attachments and relations, as well as the occasional presence of muscular fibers in its substance, show that it is the homologue of the interosseous muscles of other mammals, curiously modified both in structure and function, to suit the requirements of the horse's foot. Behind or superficial to this are placed the two strong tendons of the flexor muscles, the most superficial, or *flexor perforatus*, dividing to allow the other to pass through, and then inserted into the middle phalanx. The *flexor perforans* is as usual inserted into the terminal phalanx. In the foreleg these muscles correspond with those similarly named in man. In the hind leg the perforated tendon is a continuation of that of the plantaris, passing pulley-wise over the tuberosity of the os calcis. The perforating tendon is derived from the

muscle corresponding with the long flexor of man, and the smaller tendon of the oblique flexor (*tibialis porticus* of man) is united with it.

The hoof of the horse corresponds to the nail or claw of other mammals, but it is so constructed as to form a complete and very solid case to the expanded termination of the toe, giving a firm basis of support formed of a non-sensitive substance, which is continually renewed by the addition of material from within, as its surface wears away by friction against the ground. The terminal phalanx of the toe is greatly enlarged and modified in form to support this hoof, and the size of the internal framework of the foot is further increased by a pair of lateral fibro-cartilaginous masses attached on each side to the hinder edges of the bone, and by a fibro-cellular and adipose plantar cushion in the median part. These structures are all inclosed in the keratogenous membrane or "subcorneous integument," a continuation of the ordinary derma of the limb, but extremely vascular and having its superficial extent greatly increased by being developed into papillæ or laminae. From this the horny material which constitutes the hoof is exuded. A thickened ring encircling the upper part, called coronary cushion, and the sole are covered with numerous thickly set papillæ or villi, and take the greatest share in the formation of the hoof; the intermediate part constituting the front and side of the foot, corresponding with the wall of the hoof, is covered with parallel, fine longitudinal laminae, which fit into corresponding depressions in the inner side of the horny hoof.

The horny hoof is divided into a wall or crust consisting of the front and sides, the flattened or concave sole, and the frog, a triangular median prominence, notched posteriorly, with the apex turned forward, situated in the hinder part of the sole. It is formed of pavement epithelial cells, which are mainly grouped in a concentric manner around the vascular papillæ of the keratogenous membrane, so that a section near the base of the hoof, cut transversely to the long axis of these papillæ, shows a number of small circular or oval orifices, with cells arranged concentrically round them. The nearer the surface of the hoof, or further removed from the seat of growth, the more indistinct the structure becomes.

Small round or oval plates of horny epithelium called "chestnuts," growing like the hoof from enlarged papillæ of the skin, are found on the inner face of the fore arm, above the carpal joint in all species of *Equidae*, and in the horse (*E. caballus*) similar formations occur near the upper extremity of the inner face of the metatarsus. Their use is unknown.

Dentition.—The dentition of the horse, when all the teeth are in place, is, as seen from illustration of skull, expressed by the formula $i. \frac{3}{3}, c. \frac{1}{1}, p. \frac{4}{4}, m. \frac{3}{3} = 44$. The incisors of each jaw are placed in close contact, forming a semicircle. The crowns are broad, somewhat awl-shaped, and of nearly equal size. They have all the great peculiarity, not found in the teeth of any other mammal, and only in the *Equidae* of comparatively recent geological periods, of an involution of the external surface of the tooth, by which what should properly be the apex is carried deeply into the interior of the crown, forming a fossa or pit, the bottom of which becomes partially filled up with crusta petrosa or cementum. As the tooth wears, the surface, besides the external enamel layer as in an ordinary simple tooth, shows in addition a second inner ring of the same hard substance surrounding the pit, which of course adds greatly to the efficiency of the tooth as an organ for biting tough, fibrous substances. This pit, generally filled in the living animal with particles of food, is conspicuous from its dark color, and constitutes the

"mark" by which the age of the horse is judged, as in consequence of its only extending to a certain depth in the crown it becomes obliterated as the crown wears away, and then the tooth assumes the character of that of an ordinary incisor, consisting only of a core of dentine, surrounded by the external enamel layer. It is not quite so deep in the lower as in the upper teeth. The canines are either quite rudimentary or entirely absent in the female. In the male they are compressed, pointed, and smaller than the incisors, from which they are separated by a slight interval. The teeth of the molar series are all in contact with each other, but separated from the canines by a considerable toothless space. The anterior premolars are quite rudimentary, sometimes not developed at all, and generally fall by the time the animal attains maturity, so that there are but six functional grinding teeth—three that have predecessors in the milk dentition, and hence are considered as premolars, and three true molars, but otherwise, except the first and the last of the series, not distinguishable in form or structure. These teeth in both upper and lower jaws are extremely long-crowned or hypsodont, successive portions being pushed out as the surface wears away, a process which continues until the animal becomes advanced in age. The enameled surface is infolded in a complex manner (a modification of that found in other perissodactyles), the folds extending quite to the base of the crown, and the interstices being filled and the surface covered with a considerable mass of cement, which binds together and strengthens the whole tooth. As the teeth wear, the folded enamel, being harder than the other constituents, the dentine and cements, forms projecting ridges on the surface arranged in a definite pattern, which gives it great efficiency as a grinding instrument. The free surfaces of the upper teeth are quadrate, except the first and last, which are nearly triangular. The lower teeth are much narrower than the upper.

The milk dentition consists of $i. \frac{3}{3}, c. \frac{0}{0}, m. \frac{3}{3} = 24$ —the canines and first or rudimentary premolars having apparently no predecessors. In form and structure they much resemble the permanent teeth, having the same characteristic enamel foldings. Their eruption commences a few days after birth, and is complete before the end of the first year, the upper teeth usually appearing somewhat earlier than those of the lower jaw. The first teeth which appear are the first and second milk molars (about five days), then the central incisor (from seven to ten days); this is followed by the second incisor (at one month), then the third molar, and finally the third incisor. Of the permanent teeth the first true molar appears a little after the end of the first year, followed by the second molar before the end of second year. At about two and a half years the first premolar replaces its predecessor. Between two and a half and three years the first incisor appears. At three years the second and third premolars and the third true molar have appeared, at from three and a half to four years the second incisor, at four to four and a half years the canine, and, finally, at five years, the third incisor, completing the permanent dentition. Up to this period the age of the horse is clearly shown by the condition of dentition, and for some time longer indications can be obtained from the wear of the incisor teeth, though this depends to a certain extent upon the hardness of the food or other accidental circumstances. As a general rule, the depression caused by the infolding of the surface of the incisor (the "mark") is obliterated in the first or central incisor at six years, in the second at seven years, and in the third at eight years. In the upper teeth, as the depressions are deeper, this obliteration does not take place until about two years later.

After this period no certain indications can be obtained of the age of the horse from the teeth.

Digestive Organs.—The lips are flexible and prehensile. The membrane that lines them and the cheeks is quite smooth. The palate is long and narrow; its mucous surface has seventeen pairs of not very sharply defined oblique ridges, extending as far back as the last molar tooth, beyond which the velum palati extends for about three inches, having a soft corrugated surface, and ending posteriorly in an arched border without uvula. This embraces the base of the epiglottis, and, except while swallowing food, shuts off all communication between the cavity of the mouth and the pharynx, respiration being, under ordinary circumstances, exclusively through the nostrils. Between the mucous membrane and the bone of the hard palate is a dense vascular and nervous plexus. The membrane lining the fauces is soft and corrugated. An elongated raised glandular mass, three inches long and one inch from above downward, extending backward from the root of the tongue along the side of the fauces, with openings on the surface leading into crypts with glandular walls, represents the tonsil. The tongue, corresponding to the general form of the mouth, is long and narrow. It consists of a compressed intermolar portion with a flat upper surface, broad behind and becoming narrower in front, and of a depressed anterior part rather shorter than the former, and which is narrow behind and widens toward the evenly rounded apex. The dorsal surface is generally very soft and smooth. There are two large circumvalate papillæ near the base, rather irregular in form, about a quarter of an inch in diameter and half an inch apart. The conical papillæ are very small and close set, though longer and more filamentous on the intermolar portion. There are no fungiform papillæ on the dorsum, but a few not very conspicuous ones scattered along the sides of the organ.

Of the salivary glands the parotid is by far the largest, and elongated in the vertical direction, and narrower in the middle than at either upper or lower extremity. Its upper extremity embraces the lower surface of the cartilaginous ear-conch; its lower end reaches the level of the inferior margin of the mandible, along the posterior margin of which it is placed. Its duct leaves the inferior anterior angle, at first descends a little, and runs forward under cover of the rounded inferior border of the mandibular ramus, then curves up along the anterior margin of the masseter muscle, becoming superficial, pierces the buccinator, and enters the mouth by a simple aperture opposite the middle of the crown of the third premolar tooth. It is not quite so thick as a goosequill when distended, and nearly a foot in length.

The submaxillary gland is of very similar texture to the last, but much smaller; it is placed deeper, and lies with its main axis horizontal. It is elongated and slender, and flattened from within outward. Its posterior end rests against the anterior surface of the transverse process of the atlas, from which it extends forward and downward, slightly curved, to beneath the ramus of the jaw. The duct which runs along its upper and internal border passes forward in the usual course, lying in the inner side of the sublingual gland, to open on the outer surface of a distinct papillæ, situated on the floor of the mouth, half an inch from the middle line, and midway between the lower incisor teeth and the attachment of the frænum lingue. The sublingual is represented by a mass of glands lying just beneath the mucous membrane of the floor of the mouth on the side of the tongue, causing a distinct ridge, extending from the frænum backward, the numerous ducts opening separately along the summit of the ridge. The buccal glands are arranged in two rows parallel with the molar

teeth. The upper ones are the largest, and are continuous anteriorly with the labial glands, the ducts of which open on the mucous membrane of the upper lip.

The stomach of the horse is simple in its external form, with a largely developed right *cul de sac*, and is a good deal curved on itself, so that the cardiac and pyloric orifices are brought near together. The antrum pyloricum is small and not very distinctly marked off. The interior is divided by the character of the lining membrane into two very distinct portions, right and left. Over the latter the dense white, smooth epithelial lining of the œsophagus is continued, terminating abruptly by a raised crenellated border. Over the right part (rather the larger portion) the mucous membrane has a grayish-red color and a velvety appearance, and contains very numerous peptic glands, which are wanting in the cardiac portion. The œsophageal orifice is very small, and is guarded by a strong crescentic or rather horseshoe-like band of muscular fibers, which is supposed to be the cause of the difficulty of vomiting in the horse. The small intestine is of great length (eighty to ninety feet), its mucous membrane being covered with numerous fine villi. The cæcum is of conical form, about two feet long and nearly a foot in diameter; its walls are sacculated, especially near the base, having four longitudinal muscular bands; and its capacity is about twice that of the stomach. It lies with its base near the lower part of the abdomen, and its apex directed toward the thorax. The colon is about one-third the length of the small intestine, and very capacious in the greater part of its course. As usual it may be divided into an ascending, transverse, and descending portion; but the middle or transverse portion is folded into a great loop, which descends as low as the pubis; so that the colon forms altogether four folds, generally parallel to the long axis of the body. The descending colon is much narrower than the rest, and not sacculated, and, being considerably longer than the distance it has to traverse, is thrown into numerous folds.

The liver is tolerably symmetrical in its general arrangement, being divided nearly equal into segments by a well-marked umbilical fissure. Each segment is again divided by lateral fissures, which do not extend quite to the posterior border of the organ; of the central lobes thus cut off, the right is rather the larger, and has two fissures in its free border subdividing it into lobules. The extent of these varies, however, in different individuals. The two lateral lobes are subtriangular in form. The Spiegelian lobe is represented by a flat surface between the portal fissure and the posterior border, not distinctly marked off from the left lateral by a fissure of the ductus venosus, as this vessel is buried deep in the hepatic substance, but the caudate lobe is distinct and tongue-shaped, its free apex reaching nearly to the border of the right lateral lobe. In most works on the anatomy of the horse this has been confounded with the Spiegelian lobe of man. There is no gall-bladder, and the biliary duct enters the duodenum about six inches from the pylorus. The pancreas has two lobes or branches, a long one passing to the left and reaching the spleen, and a shorter right lobe. The principal duct enters the duodenum with the bile-duct, and there is often a second small duct which opens separately near to this.

Circulatory and Respiratory Organs.—The heart has the form of a rather elongated and pointed cone. There is one anterior vena cava, formed by the union of the two jugular and two axillary veins. The aorta gives off a large branch (the anterior aorta) very near its origin, from which arise—first, the left axillary, and afterward the right axillary and the two carotid arteries.

Under ordinary circumstances the horse breathes entirely by the nasal passages, the communication between the larynx and the mouth being closed by the velum palati. The nostrils are placed laterally, near the termination of the muzzle, and are large and very dilatable, being bordered by cartilages upon which several muscles act. Immediately within the opening of the nostril, the respiratory canal sends off on its upper and outer side a diverticulum or blind pouch (called "false nostril") of a conical form, and curved, two to three inches in depth, lying in the notch formed between the nasal and premaxillary bones. It is lined by mucous membrane continuous with that of the nasal passage, and its use is not apparent. It is longer in the ass than in the horse. Here may be mentioned the guttural pouches, large air sacs, diverticula from the Eustachian tubes, and lying behind the upper part of the pharynx, the function of which is also not clearly understood. The larynx has the lateral sacculi well developed, though entirely concealed within the alæ of the thyroid cartilage. The trachea divides into two bronchi, one for each lung.

Nervous System.—The brain differs little, except in details of arrangement of convolutions, from that of other ungulates. The cerebral hemispheres are rather elongated and subcylindrical, the olfactory lobes are large, and project freely in front of the hemispheres, and the greater part of the cerebellum is uncovered. The eye is provided with a nictitating membrane or third eyelid, at the base of which the ducts of the Harderian gland open.

Reproductive System.—The testes are situated in a distinct sessile or slightly pedunculated scrotum, into which they descend from the sixth to the tenth month after birth. The accessory generative glands are the two vesiculæ seminales, with the median third vesicle, or *uterus masculinus*, lying between them, the single bilobed prostate, and a pair of globular Cowper's glands. The penis is very large, cylindrical, with a truncated, expanded, flattened termination. When in a state of repose it is retracted, by a muscle arising from the sacrum, within the prepuce; a cutaneous fold attached below the symphysis pubis.

The uterus is bicornuate. The vagina is often partially divided by a membranous septum or hymen. The mammae are two, inguinally placed. The surface of the chorion is covered evenly with minute villi, constituting a diffuse non-deciduate placenta. The period of gestation is eleven months.

History.—The first mention of the British horse occurs in the well-known passages in Cæsar, in which he mentions the native "essedarii" and the skill with which they handled their war chariots. We are left quite in the dark as to the character of the animal thus employed; but there would appear to be much probability in the surmise of Youatt, who conjectures the horse to have been, "then as ever, the creature of the country in which he lived. With short fare, and exposed to the rigor of the seasons, he was probably the little hardy thing we yet see him; but in the marshes of the Nen and the Witham, and on the borders of the Tees and the Clyde, there would be as much proportionate development of frame and strength as we find at the present day."

The period of the Norman Conquest marks an important stage in the history of the British horse. William the Conqueror's own horse was of the Spanish breed, and others of the same kind were introduced by the barons on their estates. But the Norman horses included many varieties, and there is no doubt that to the Conquest the inhabitants of Britain were indebted for a decided improvement in the native horse, as well as for

the introduction of several varieties previously unknown.

In 1121 two Eastern horses are said to have been imported—one of them remaining in England, and the other being sent as a present by King Alexander I. to the church of St. Andrews, in Scotland. It has been alleged that these horses were Barbs from Morocco, but a still more likely theory is that they existed only in name, and never reached either England or Scotland. The crusades were probably the means of introducing fresh strains of blood into England, and of giving opportunity for fresh crossings. The Spanish jennet was brought over about 1182. King John gave great encouragement to horse-breeding; one of his earliest efforts was to import one hundred Flemish stallions, and, having thus paved the way for improving the breed of agricultural horses, he set about acquiring a valuable stud for his own use.

Charles II. warmly espoused the introduction of Eastern blood into England. He sent his master of the horse abroad to purchase a number of foreign horses and mares for breeding, and the mares brought over by him (as also many of their produce) were called "royal mares;" they form a conspicuous feature in the annals of breeding. The *Stud-Book* shows of what breed the royal mares really were; one of them, the dam of Dodsworth (who, though foaled in England, was a natural Barb), was a Barb mare; she was sold by the stud-master, after Charles II.'s death, for forty guineas, at twenty years old, when in foal by the Helmsley Turk.

The reign of William III. is noteworthy as the era in which, among other importations, there appeared the first of three Eastern horses to which the modern thoroughbred race-horse traces back as the founders of his lineage. This was the Byerly Turk, of whom nothing more is known than that—to use the words of the first volume of the *Stud-Book*—he was Captain Byerly's charger in Ireland in King William's wars. The second of the three horses above alluded to was the Darley Arabian, who was a genuine Arab, and was imported from Aleppo by a brother of Mr. Darley of Aldby Park, Yorkshire, about the end of the reign of William III. or the beginning of that of Anne. The third horse of the famous trio was the Godolphin Arabian or Barb, brought to England about five and twenty years after the Darley Arabian. All the horses now on the British turf or at the stud trace their ancestry in the direct male line to one or other of these three—the Byerly Turk, the Darley Arabian, and the Godolphin Arabian or Barb. In the female line their pedigrees can be traced to other sources, but for all practical purposes it suffices to regard one or other of these three animals as the *ultima Thule* of racing pedigree. Of course there is a large interfusion of the blood of each of the trio through the dams of horses of the present day; indeed, it is impossible to find an English race-horse which does not combine the blood of all three.

The last epoch of the British horse, viz., that of the thoroughbred racer, may be taken to date from the beginning of the eighteenth century. By thoroughbred is meant a horse or mare whose pedigree is registered in the *Stud-Book* kept by Messrs. Weatherby, the official agents of the Jockey Club—originally termed the keepers of the match-book—as well as the publishers of the *Racing Calendar*.

The shape of a race-horse is of considerable importance, although it is said with some degree of truth that they win in all shapes. In height it will be found that the most successful racers average from fifteen to sixteen and one-half hands, the former being considered somewhat small, while the latter is unquestionably very

large; the mean may be taken as between fifteen and one-half and sixteen hands (the hand = four inches). The head should be light and lean, and well set on; the ears small and pricked, but not too short; the eyes full; the forehead broad and flat; the nostrils large and dilating; the muzzle fine; the neck moderate in length, wide, muscular, and yet light; the throat clean; the windpipe spacious and loosely attached to the neck; the crest thin, not coarse and arched; the withers may be moderately high and thin; the chest well developed, but not too wide or deep; the shoulders should lie well on the chest, and be oblique and well covered with muscle, so as to reduce concussion in galloping; the upper and lower arms should be long and muscular; the knees broad and strong; legs short, flat, and broad; fetlock joints large; pasterns strong and of moderate length; the feet should be moderately large, with the heels open and frogs sound—with no signs of contraction. The body or barrel should be moderately deep, long, and straight, the length being really in the shoulders and in quarters, the back should be strong and muscular, with the shoulders and loins running well in at each end; the loins themselves should have great breadth and substance, this being a vital necessity for weight-carrying and propelling power uphill. The hips should be long and wide, with the stifle and thigh strong, long, and proportionately developed, and the hind quarters well let down. The hock should have plenty of bone, and be strongly affixed to the leg, and show no signs of curb; the bones below the hock should be flat, and free from adhesions; the ligaments and tensions well developed, and standing out from the bone; the joints well formed and wide, yet without undue enlargement; the pasterns and feet similar to those of the forehead. The tail should be high set on, the croup continuing in a straight line to the tail, and not falling away and drooping to a low set tail. Fine action is the best criterion of everything fitting properly, and all a horse's points ought to harmonize or be in proportion to one another, no one point being more prominent than another, such as good shoulders, fine loins, or excellent quarters. If the observer is struck with the remarkable prominence of any one feature, it is probable that the remaining parts are deficient. A well-made horse wants dissecting in detail, and then if a good judge can discover no fault with any part, but finds each of good proportion, and the whole to harmonize without defect, deformity, or deficiency, he has before him a well-shaped horse; and of two equally well-made and equitably well-proportioned horses the best bred one will be the best. As regards hue, the favorite color of the ancients, according to Zenophon, was bay, and for a long time it was the fashionable color in England; but for some time chestnut thoroughbreds have been the most conspicuous figure on English race-courses, so far as the more important events are concerned. Eclipse was a chestnut; Castrel, Selim, and Rubens were chestnuts; so also were Glencoe and Pantaloon, of whom the latter had black spots on his hind quarters like Eclipse, and more recently Stockwell and Doncaster. Birdcatcher was a chestnut, so also were Stockwell and his brother Ratanaplan, Manganese, Mandragora, Thormanby, Kettle-drum, St. Albans, Blair Athol, Regalia, Formosa, Hermit, Marie Stuart, Doncaster, George Frederick, Apology, Craig Millar, Prince Charlie, Rayon d'Or, and Bend Or. The dark browns or black browns, such as the Sweetmeat tribe, are not so common as the bays, and black or gray horses are almost as unusual as roans. The skin and hair of the thoroughbred are finer, and the veins which underlie the skin are larger and more prominent than in other horses. The mane and tail should be silky and devoid of curl, which is a sign of impurity.

Whether the race-horse of to-day is as good as the stock to which he traces back has often been disputed, chiefly no doubt because he is brought to more early maturity, commencing to win races at two years instead of at five years of age, as in the days of Childers and Eclipse; but the highest authorities, and none more emphatically than the late Admiral Rous, aver that he can not only stay quite as long as his ancestors, but also go a good deal faster. In size and shape the modern race-horse is unquestionably superior, being on an average fully a hand higher than the Eastern horses from which he is descended; and in elegance of shape and beauty of outline he has certainly never been surpassed. That experiments, founded on the study of his nature and properties, which have from time to time been made to improve the breed, and bring the different varieties to the perfection in which we now find them, have succeeded, is best confirmed by the high estimation in which the horses of Great Britain are held in all parts of the civilized world; and it is not too much to assert that, although the cold, humid, and variable nature of their climate is by no means favorable to the production of these animals in their very best form, Englishmen have by great care, and by sedulous attention to breeding, high feeding, and good grooming, with consequent development of muscle, brought them to the highest state of perfection of which their nature is capable.

The Hunter.—A good specimen of an English hunter may be described as a horse for universal use. He may be a coach-horse, for in many of the animals running in the coaches called into existence during the summer months, by the coaching revival may be recognized a hunter of known character; he may be a good roadster, for, so far as conformation is concerned, there is nothing in a hunter to unfit him from being a first-class hack; nor is hunting incompatible with military duties, for, by the regulations of the service, officers are permitted to hunt their second chargers. For harness work he is perfectly adapted, provided only the vehicle to be drawn is in proportion to his size; while most people will recall instances of hunters having for some reason or other to be so far humbled as to have to take a turn at the plow or harrow, or, in their older days, even in a chaff-cutter. A hunter may be either thoroughbred or half bred. It is often said that thoroughbreds do not make pleasant hunters, but the complaint, if there is any ground for it at all, is really against the result of the treatment to which nineteen out of the twenty thoroughbreds have to submit, and not against pure blood itself. A large proportion of the thoroughbred stock come to the starting post at two years old; and this means that they have been in the trainer's hands since they were yearlings at least. Now a training stable is just the place for colts to pick up sundry undesirable tricks, which may at some future time cause the unprofessional rider a little trouble; they get to lean on the hand, often turn out fidgety and fractious, and are not infrequently inveterate pullers. When fit to go, the young one will have been tried, and if he fails to gallop half a mile at best pace he is probably turned out of training, although perhaps it was not till the last dozen yards were reached that there was any sign of failing power. Now, although the colt may be unable to stand the test applied to him by the trainer, there is no reason at all why he should not be able to go all day at hunting pace, because the powers of speed are not taxed to the same degree. The young thoroughbred is then perhaps educated for hunting; and hence it is that nearly all hunters—thoroughbred ones, that is to say—begin life in a training stable.

In breeding a hunter the choice of a dam is a matter

of moment; and it is difficult to see why anything should be thought good enough for a hunter, even by the inexperienced. The first requisite for a brood-mare is that she should be free from all constitutional infirmities, such as roaring, bad sight, etc.; and the breeder should be on his guard when breeding from mares whose legs have given way. True, it may be the result of an accident, but care should be taken to ascertain that it arose from that cause, and that a predisposition to inflammation had nothing to do with it. For the same reason persons should be chary of breeding from mares that have splints, spavins, etc., and should certainly reject one whose dam or sire had them as well. Mares that have done much hard work are not the best dams that can be selected, as they are apt to slip their foals, or to throw undersized ones. The selection of a stallion is the more important the more defects there are in the mare. Should she be the least delicate, the stallion should be remarkable for a hardy constitution, for considering that a hunter has to be out of his stable for as much as twelve hours sometimes, and rarely less than seven or eight, and has to carry a heavy weight and gallop and jump, it is plain that a horse with no stamina would be nearly worthless as a hunter, no matter what other good qualities he might possess. So, too, as to shape; should the mare be too long on the leg or in the back, or too low in front, the stallion should be singularly free from the defect in question.

While the mare is in foal she should be kept on the best food, for the nourishment given to her is given indirectly to the foal. The keep of the foal in its early days is not less important than the choice of dam and sire. Thoroughbred colts eat corn from the time they are a month or five weeks old; and the same generous diet should be allowed to halfbred horses, as it is only by this, accompanied of course by proper exercise, that the frames of young horses expand to their full extent, or that a foundation is laid for a good constitution.

The breaking and training of hunters is all-important, because, in spite of the care that may have been expended upon the choice of sire and dam and the keep of the colt, many young ones are ruined beyond all hope of recovery during this process. The colt should be handled from the day of its birth, so that it may grow thoroughly accustomed to man, without ever having experienced the feeling of fear. The person selected to attend on mares and foals, as well as he that undertakes the training part, should be naturally fond of animals; he should be cool and of an almost imperturbable temper, or he will be unfitted to deal with the waywardness of some of his pupils, which during their early career may at times expose him to personal danger, especially if they be well bred; he should therefore be well endowed with courage and firmness, for an irresolute man is sure to spoil every horse he has to do with.

The Hack.—Under the term "hack" may be ranked cover hack, park hack, cob, pony, and, in short, saddle-horses of all kinds save hunters and racers.

The park hack, as its name implies, is for use in fashion-frequented places, and must therefore be worth looking at. Fashion has prescribed that the genuine thing shall be about 14.3, with a small and well set-on head, good sloping shoulders, and well-formed hind legs; he must also be very well bred. So much for his points. A wonderfully good temper is absolutely essential. Street vehicles give but little place to the equestrian, and a series of hurried retreats out of harm's way might ruffle a horse of uncertain temper and not hard worked into the bargain. He should be bitted to a nicety, and should have been thoroughly well trained. Especial care should be exercised in the selection of the

lady's horse; and the perfection which is so often theoretical in the case of a gentleman's hack should approach a reality when a horse is intended to carry a lady. With regard to the size, it had better not be under 15.1 at the least, and should have very good shoulders and by no means a short neck, or else the rider will experience that uncomfortable sensation of having nothing in front of the saddle.

The cob is a nondescript animal, but withal a very valuable one when good. An underbred thickset animal, termed a "stocky" horse, is not the fashionable cob, which should have a good deal of breeding and the strength of a dray-horse. Although a cob should not exceed 14.1, he should be very strong, being generally ridden by elderly heavy persons. To be worth a large sum he must unite to a symmetrical shape an even temper, perfect manners, and easiness in his paces.

A Galloway, although strictly speaking a distinct breed, is commonly understood to be a horse of not over fourteen hands.

A pony must be less than fifty-two inches (thirteen hands) from the ground to the top of the withers; else he is a Galloway. Ponies, as a rule, will do far more work than a full-sized horse; they improve wonderfully in a well-organized stable; they are, it is said, never lame in the feet, and seldom become roasters; but, as a set off against these good points, they are often very tricky, and sometimes troublesome in the stable.

The breeding of hacks, like breeding for any particular stamp of horse, is all chance work, especially in the case of halfbreeds. A rather small thoroughbred horse and a hackney mare may produce a thing like a pony, or a bigger animal that is quite useless for saddle work. Even in breeding for hunters, two or perhaps three out of five colts will grow up more fitted for the shafts than for a bridle. Perhaps the generality of hacks are either thoroughbreds which have been turned out of training, or horses that have grown up too small for hunting purposes.

The Charger and Troop-Horse.—A charger, fit for the mounted arm of the service, is a difficult article to meet with, at least a perfect one is, because so many good qualities must be found combined. A hunter is capital raw material out of which to make a charger; but appearance, which is not a *sine qua non* in a hunter, is indispensable in a charger, which must also have high action, though the paces must be easy in consequence of much riding having to be done without stirrups. The best size for a charger or a trooper is about 15.2 or 15.3; moderate-sized horses can be made more handy than larger ones, and experience seems to show that they are more hardy and better doers than horses of greater stature.

The troop-horse must be as much like the charger as possible, but, as the trooper's price is limited, a difference, and that a very striking one, must always exist. The bulk of the troop-horses are bought when rising four years, having of course been passed by the veterinary surgeon; and, being nourished on the best food, these often develop into well-grown animals by the time they take their place in the ranks. Before that time comes, however, there is a good deal to be done in the way of training, for no matter how quiet the four-year-old may be to ride, or how well he may have been broken from a civilian's point of view, he is no more fitted for cavalry purposes, until he has passed through the rough rider's hands, than if he had never been handled at all.

As the cavalry soldier has to use his weapons with one hand, he has only one for the reins; and this renders it important first that the horse should be so broken that the rider can effect with his leg or heel what civilians do

with the second hand, and next that the horse should be well under the control of a single hand. As before remarked, the position of the head makes a great difference in the ease with which the horse can be governed, and as troopers have all to do the same things in the saddle, it follows that they should as far as possible all ride the same sort of horses; accordingly all troop-horses are trained to carry their heads as nearly as possible in one position, that being chosen in which the angle formed by the head and neck gives most power to the rider.

Harness-Horses.—Just as a hunter is metamorphosed into a hack by using a sharper bit and riding him on the road, so the mere fact of driving a horse in harness makes him a harness-horse, whether he really be hack, hunter or charger.

The Cart-Horse.—At the present time it is difficult to classify cart-horses, and to point to any distinct breeds. The true Cleveland horse is practically extinct, and the animal now called a Cleveland bay bears but a slight resemblance to his ancestors. The old Cleveland horses were noted for their strength; they are said to have carried a weight of 760 lb., or more than fifty-four stone, a distance of sixty miles in twenty-four hours. The old Suffolk Punch, originally descended from Norman stallions and Suffolk cart naves, is also extinct, the modern representative of that breed being the result of different crossings; he is found of two different kinds, light and heavy. The Clydesdale horse is well adapted for use in a hilly country. It derives its name from a district on the Clyde in Scotland, whither it was introduced by one of the dukes of Hamilton, who crossed the Lanark mares with imported Flemish stallions.

The native English cart-horse is a huge animal, usually of a black color, and stands about seventeen hands high and more. These horses are bred chiefly but not solely in Lincolnshire. At two years old they are generally sold by the breeder, who thus is enabled to secure a fair profit at an early period. They are at once put to gentle work by the first purchaser, and so earn something toward their keep. During this period they are well fed, and when they have attained their fourth year they are made up for the market, by being fed with oilcake, grains and other fattening food, besides oats.

The use of these very heavy horses is now chiefly confined to brewers' drays, to contractors' trollies for conveying blocks of stone, and for drawing carts containing building materials, and heavy iron work, such as boilers, parts of bridges, etc. From their great size they require a large amount of food; and, although occasionally useful for drawing heavy weights, they are being gradually displaced by a lighter and more active horse.

The foregoing refers to the horse as at present existing in England. We shall now deal extensively with the American horse as at present existing and developed in this country. There were no horses in this country when Columbus discovered America, although the discovery of fossil remains amply prove that they, during geological periods, existed here. How and why they became extinct must remain a matter of speculation. The first introduction of the animal was by the Spaniards not long after the discovery of the continent. They were mainly taken to South America and formed the origin of the vast herds of horses now ranging the pampas of that continent. The descendants of these Spanish horses are also found in North America, Mexico, California, and Texas having vast herds of *Mustangs*, which are regarded as the progeny of the imported animals. The American horse, at the present day, is the descendant, in various degrees, of an admixture from the English thoroughbred racer. Early in

colonial times the gentlemen of the colonies began the importation of finely-bred horses, Virginia and Maryland being preëminent in this respect among their sister provinces. In 1730 Bully Rook, a descendant of Darley Arabian in the first generation, was brought over, and in 1740 Bonny Lass, a mare, descended from the same horse in the next degree, followed. After this time the importation of blooded stock became common, and it is said that more than 300 names are on the list of fine animals brought over prior and immediately subsequent to the Revolution. These were interbred with the preëxisting American stock, to the great improvement of the latter. From such a source the existing American racer sprang.

Prominent, and the most important indeed, among these importations was the thoroughbred stallion Messenger. He was brought to this country in 1788—being then eight years old. He stood for a long period in New York and Pennsylvania, and some of our best horses trace back to him. Among his distinguished descendants may be named Hambletonian, Potomac, Mambrino, Engineer, Bay Figure, Tippeo Saib, and the great horse Eclipse. Another distinguished import was the Arabian Ranger, who is credited with the origin of a number of fine animals.

Among other breeds of horses, less for the race-track, and yet noted for beauty and excellence, may be mentioned the Morgans, the progenitor of which strain was a Vermont horse of unknown (or at least doubtful) ancestry. The Morgans are excellent roadsters, possessing much to recommend them, but having few marks of the thoroughbred.

The Narragansett pacers, now extinct, were also in their day a noted strain. They were bred in New England from a Spanish horse, imported by Governor Robinson. Their speed and endurance, and easy natural gait (a pace) made them great favorites, and large numbers of them were exported to Cuba, but the strain has been lost to sight, and no genuine specimen of the breed is now known to exist.

Of late years the breeding of draught-horses has received great attention in America—many large stock-farmers paying almost exclusive attention to their production. For this purpose they have spared neither pains nor expense, and on some of the breeding farms may be seen the finest specimens of Norman-Percheron, Clydesdale, and other heavy draught-stallions. Illinois stands in an honorable place on the list of States breeding draught-horses, and the result of the efforts of the breeders to attain excellence in the animals they produce may be seen every day on the streets of our larger American cities, than which no other localities of the world can exhibit finer, better-appearing draught animals. The Conestoga is a peculiarly American strain of draught-horse of unknown origin, so-called from the fact that it was produced in the Conestoga valley, Penn. They are very large, but do not incline to much flesh, and are quick in action, when their large size is taken into consideration.

But the crowning glory of American horse breeding is the trotting-horse. The development of this horse is interesting in the extreme. In the olden days of American races, the only gait known to the turf was running. As before shown, our runners came from England or were descendants of English horses. Races were a passion with the southern gentry, and Virginia and Kentucky were famous all over the world for their productions in the line of running-horses. Almost every hamlet in those two states had its race-track, and in many instances the gentlemen farmers kept their private tracks on which they speeded their horses or ran against their neighbors. There was a regular racing circuit

which included all these points, great and small, and the owners of the various horses traveled the circuit, being sure always of finding a contestant for the honors of the turf everywhere, no matter how small the town or village in point of population. For many years this state of affairs subsisted, the trotting-horse as yet being an unknown factor in racing matters. The older patrons of the turf did not readily or kindly take to the innovation of the trotter, for there yet "lag superfluous on the stage" old-fashioned horsemen who are persistently blind to the merits of the trotter, and declare that none other than a running-horse is a legitimate race-animal. But in spite of such opposition, the running-horse was destined for a time to be completely eclipsed by an animal of unknown or doubtful extraction, yet one whose present degree of perfection is one of the greatest triumphs of patience and judicious selection. As stated before, the trotters have no particular lineage; they were not, so to speak, "born to the purple," but only came to the front by sheer force of merit. One of the best of our older trotters (Dutchman) was a common cart-horse; and in but very few instances could any of them trace back to a thoroughbred origin. Some attempts have been made to establish the claim that the trotter is a distinct species or strain of horse, but this ground is clearly untenable if one will only consider the history of his origin. He, as at present existing, is but the result of the careful selection and mating of animals having a disposition to trot naturally, and then judiciously admixing later on the thoroughbred blood, with that of the progeny thus got. No breed of horses has ever made such rapid growth in speed as well as in public favor. At first 2:50 was thought good—very good—time for a mile at that gait, while 2:40 was beyond improvement, and yet in a less number of years the record has been successively lowered by $3\frac{1}{4}$ seconds.

Below are given the trotting, pacing, and racing records, amended up to date, February, 1899. The trotting being given first:

Against time—One mile, all ages, Sunol, Stockton, Cal., October 20, 1891, 2:08 $\frac{1}{4}$. In a race—Nancy Hanks, Independence, Iowa, August 27, 1891, 2:12.

Two miles—Fanny Witherspoon, Chicago, September, 25, 1885, 4:43.

Three miles—Huntress, Prospect Park, Long Island, September 23, 1872, 7:21 $\frac{1}{4}$.

Four miles—Satellite, Keokuk, Iowa, August 12, 1888, 10:52 $\frac{1}{2}$.

Five miles—Lady Mack, Oakland, California, April 2, 1874, 13:00.

Ten miles—Controller, San Francisco, November 23, 1878, 27:23 $\frac{1}{4}$.

Twenty miles—Capt. Megowan, Boston, October 2, 1865, 58:25.

Fifty miles—Ariel, Albany, New York, May 5, 1846, 3:55:40 $\frac{1}{2}$.

One hundred miles—Conqueror, Long Island, November 12, 1858, 8:56:01.

One mile, to wagon—Allerton, Independence, Iowa, September 25, 1891, 2:15.

One mile, under saddle—Great Eastern, New York, September 22, 1877, 2:15 $\frac{1}{4}$.

One mile, double team—Belle Hamlin and Justina, Independence, October 24, 1890, 2:13.

One mile, triple team—Belle Hamlin, Globe, and Justina, Cleveland, Ohio, July 28, 1891, 2:14.

One mile, with running mate—H. B. Winship with Gate Case, Providence, August 1, 1881, 2:06.

One mile, yearling—Belle Bird (Electioneer), Stockton, California, October 21, 1891, 2:26 $\frac{1}{4}$.

One mile, 2-year-old—Arion (Electioneer), Stockton, California, October 21, 1891, 2:14 $\frac{1}{2}$.

One mile, 3-year-old—Sunol, San Francisco, November 9, 1889, 2:10 $\frac{1}{2}$.

One mile, stallion—Allerton, Independence, Iowa, September 19, 1891, 2:09 $\frac{1}{4}$.

Three mile heats, in a race—Nancy Hanks, Independence, Iowa, August 27, 1891, 2:12, 2:13 $\frac{1}{4}$, 2:12.

Three mile heats, exhibition—Mand S, Philadelphia, July 26, 1891, 2:12, 2:13 $\frac{1}{4}$, 2:12 $\frac{1}{4}$.

Four mile heats—Bachelor, Oakland, Cal., February 22, 1899, 7:16 $\frac{1}{2}$.

PACING.

One mile, all ages, against time—Direct, Independence, Iowa, September 4, 1891, 2:06. In a race, Direct, Columbia, Tennessee, October 26, 1891, 2:08.

Two miles—Defiance and Longfellow, dead heat, Sacramento, December 26, 1878, 4:47 $\frac{1}{2}$.

Three miles—James K. Polk, Centerville, Long Island, September 13, 1877, 7:44.

Four miles—Longfellow, San Francisco, December 31, 1881, 10:34 $\frac{1}{2}$.

Five miles—Lady St. Clair, San Francisco, December 11, 1874, 12:54 $\frac{1}{4}$.

One mile, to wagon—Roy Wilkes, Independence, Iowa, October 30, 1891, 2:13.

One mile, under saddle—Johnston, Cleveland, August 3, 1888, 2:13.

One mile, team—Richball and Westmont, Providence, September 11, 1884, 2:19.

One mile, with running mate—Westmont, Chicago, July 19, 1884, 2:01 $\frac{1}{4}$.

One mile, yearling—Rollo, Jerome Eddy, Independence, October 27, 1891, 2:28 $\frac{1}{2}$.

One mile, 2-year-old—Manager, Nutwood, Independence, August 29, 1890, 2:30 $\frac{1}{4}$.

One mile, 3-year-old—Manager, Independence, September 6, 1891, 2:11 $\frac{1}{2}$.

One mile, stallion—Direct, Independence, Iowa, September 4, 1891, 2:06.

Three mile heats race—Direct, Columbia, Tennessee, October 26, 1891, 2:09, 2:08, 2:08 $\frac{1}{4}$.

Three mile heats—Anaconda and Coney, of Detroit, Mich., July 17, 1901, 2:02, 2:02 $\frac{1}{4}$, 2:03 $\frac{1}{2}$.

RUNNING.

Quarter of a mile—Bob Wade, 5, Helena, Montana, September 20, 1891, 0:21 $\frac{1}{4}$.

Three furlongs—Eclipse, Jr., 5, Deer Lodge, Montana, July 10, 1891, 0:34 $\frac{1}{4}$.

Half a mile—Geraldine, 4, 122 pounds, Morris Park, August 30, 1889, 0:46.

Five furlongs—Britannic, 5, 122 pounds, August 31, 1889, Fordham, 6, 115 pounds, May 31, 1890. Sallie McClelland, 2, 115 pounds, May 31, 1890. Annie Queen, 2, 110 pounds, July 12, 1891. All at Morris Park, 0:59.

Five furlongs and one-half—La Tosca, 3, 111 pounds, Morris Park, June 4, 1891, 1:04 $\frac{1}{4}$.

Three quarters of a mile—Fides, 4, 116 pounds, Morris Park, May 31, 1890, 1:10 $\frac{1}{4}$.

Six and one-half furlongs—Rinfax, 3, 106 pounds, San Francisco, April 30, 1891, 1:20 $\frac{1}{4}$.

Seven furlongs—Lake View, 5, 123 pounds, Chicago, Garfield Park, August 17, 1891; Bella B, 5, 103 pounds, Monmouth Park, straight, July 8, 1890. Both 1:23 $\frac{1}{2}$.

One mile—Salvator, 4, 110 pounds, Monmouth Park, straight course, against time, August 28, 1890, 1:35 $\frac{1}{2}$.

Raveloe, 3, 107 pounds, Monmouth Park, straight, July 31, 1890, 1:39 $\frac{1}{4}$; Racine, 3, 107 pounds, Chicago, Washington Park, July 28, 1890, 1:39 $\frac{1}{2}$.

One mile and seventy yards—Whitney, 3, 102 pounds, Chicago, Garfield Park, August 18, 1891, 1:44 $\frac{1}{2}$.

One mile and one-sixteenth—Aloha, 6, 110 pounds; Van Buren, 3, 90 pounds, Chicago, Garfield Park, August 11, 1891. Both 1:46.

One mile and one-eighth—Tristan, 6, 114 pounds, Morris Park, June 2, 1891, 1:51 $\frac{1}{2}$.

One mile and three-sixteenths—Tristan, 5, 102 pounds, Sheepshead Bay, September 4, 1890, 2:00 1-5.

One mile and a quarter—Salvator, 4, 122 pounds, Sheepshead Bay, June 25, 1890, 2:05; Banquet, 3, 108 pounds, Monmouth Park, straight, July 17, 1890, 2:03 $\frac{1}{4}$.

One mile and 500 yards—Ben d'Or, 4, 115 pounds, Saratoga, July 25, 1882, 2:10 $\frac{1}{2}$.

One mile and three furlongs—Ormie, 4, 105 pounds, Chicago (Washington Park), July 7, 1890, 2:20 $\frac{1}{4}$.

One mile and one-half—Firenzi, 6, 117 pounds, Sheepshead Bay, June 26, 1890, 2:33.

One mile and five furlongs—Hindooecraft, 3, 75 pounds, Morris Park, August 27, 1889, 2:48.

One mile and three-quarters—Hotspur, 5, 117 pounds, San Francisco, August 30, 1891, 3:00 $\frac{3}{4}$.

One mile and seven furlongs—Enigma, 4, 90 pounds, Sheepshead Bay, September 15, 1885, 3:20.

Two miles—Ten Broeck, 5, 110 pounds, Louisville, May 29, 1877, against time, 3:27 $\frac{1}{2}$; Wildmoor, 6, Kansas City, September 29, 1882, 3:28.

Three miles—Drake Carter, 4, 115 pounds, Sheepshead Bay, September 6, 1884, 5:24.

Four miles—Ten Broeck, 4, 104 pounds, Louisville, September 27, 1876, against time, 7:15 $\frac{1}{2}$; Fellowcraft, 4, 108 pounds, Saratoga, August 20, 1874, 7:19 $\frac{1}{2}$.

HEAT RACES.

Quarter of a mile—Sleepy Dick, a., Kiowa, Kansas, November 24, 1888, 0:21½, 0:22½.

Half a mile—Bogus, a., 113 pounds, Helena, Montana, August 22, 1888, 0:48, 0:48.

Five furlongs—Kittie Pease, 4, Dallas, Texas, November 2, 1887, 1:00, 1:00. Sudie McNairy, 3, 98 pounds, Chicago, July 2, 1883, 1:02½, 1:03.

Three-quarters of a mile—Lizzie S., 5, 118 pounds, Louisville, September 28, 1883, 1:13½, 1:13½.

One mile—Guido, 4, 117 pounds, Chicago, Washington Park, July 11, 1891, 1:41½, 1:41. Three in five heats L'Argentine, 6, 115 pounds, St. Louis, June 14, 1879, 1:43, 1:44, 1:47¾.

One mile and one-sixteenth—Slipalong, 5, 115 pounds, Chicago, Washington Park, September 2, 1885, 1:50½, 1:48.

One mile and one-eighth—Gabriel, 4, 112 pounds, Sheepshead Bay, September 23, 1880, 1:56, 1:56.

One mile and one-quarter—Glenmore, 5, 114 pounds, Sheepshead Bay, September 25, 1880, 2:10, 2:14.

One mile and one-half—Bigaroon, 4, Lockport, July 4, 1872, 2:42½, 2:43.

Two miles—Miss Woodford, 4, 107½ pounds, Sheepshead Bay, September 20, 1884, 3:33, 3:31½.

Three miles—Norfolk, 4, 100 pounds, Sacramento, September 23, 1865, 5:27½, 5:29½.

Four miles—Ferida, 4, 105 pounds, Sheepshead Bay, September 18, 1880, 7:23½, 7:41.

With all the record breaking that has been going on among the trotters there are still only forty-four with records of 2:15 or better. Thirteen of them have retired and six are dead. Fourteen of the records were made on kite tracks. Here is the list:

NAME.	SIRE.	DATE.	RECORD.
Sunol, b m (k).....	Electioneer.....	1891.....	2:08¾
Maud S., c m (r).....	Harold.....	1885.....	2:08¾
Nancy Hanks, b m.....	Happy Medium.....	1891.....	2:09
Allerton, br h (k).....	Jay Bird.....	1891.....	2:09½
Jay Eye See, blk g (r) Dictator.....		1884.....	2:10
Nelson, b h.....	Young Rolfe.....	1891.....	2:10
Palo Alto, b h (k).....	Electioneer.....	1891.....	2:10
Guy, blk g.....	Kentucky Prince.....	1889.....	2:10¾
Stamboul, br h.....	Sultan.....	1890.....	2:11
St. Julien, b g (d).....	Volunteer.....	1880.....	2:11½
Delmarch, b h.....	Hambrino.....	1891.....	2:11½
Axtell, b c.....	William L.....	1889.....	2:12
Jack, gr g (k) (r).....	Pilot Medium.....	1890.....	2:12½
Margaret S., b f (k).....	Director.....	1890.....	2:12½
Belle Hamlin, b m.....	Hamlin's Alm't jr.....	1889.....	2:12¾
Mary Marsh'l, b m (k) Billy Wilkes.....		1891.....	2:12¾
Maxey Cobb, b h (d).....	Happy Medium.....	1884.....	2:13½
Rarus, b g (d).....	Conklin's Abd'l'h.....	1878.....	2:13½
R. Rysdyk, b h (k).....	William Rysdyk.....	1891.....	2:13½
B. McGregor, b h (r).....	Rbt. McGregor.....	1889.....	2:13½
H. Wilkes, b g (r).....	George Wilkes.....	1887.....	2:13½
Pat Downing, b g (k).....	Abe Downing.....	1891.....	2:13½
Phallas, b h (r).....	Dictator.....	1884.....	2:13¾
Vic H., br m.....	Reavis' Blackb'd.....	1891.....	2:13¾
Clingstone, b g (r).....	Rysdyk.....	1882.....	2:14
Gol'h Maid, b m (d).....	Alex'r's Abdallah.....	1874.....	2:14
Trinket, b m (r).....	Princes.....	1881.....	2:14
Homestake, b g.....	Gilbralter.....	1890.....	2:14½
Nelly W., gr m.....	Artha Goldust jr.....	1891.....	2:14½
Patron, b h (r).....	Pancoast.....	1887.....	2:14½
Alvin, ch h (k).....	Orpheus.....	1890.....	2:14½
Arion, b c (k).....	Electioneer.....	1891.....	2:14½
B. Wilmore, b h (k).....	Wilmore.....	1891.....	2:14½
Lucas, br h (k).....	Inca.....	1891.....	2:14½
R. Wilkes, b m.....	Conn's H. Wilkes.....	1888.....	2:14½
Hopeful, gr g (r).....	Godfrey Patch'n.....	1878.....	2:14¾
Pickpania, b m.....	Pickpocket.....	1891.....	2:14¾
P. Wilkes, ch g (r).....	Red Wilkes.....	1888.....	2:14¾
Alabas'r, gr c (k) (d).....	Abderden.....	1890.....	2:15
Arab, b g (r).....	Arthurton.....	1888.....	2:15
Charleston, ch h (k).....	Bourbon Wilkes.....	1891.....	2:15
Favonia, b m (d).....	Wedgewood.....	1888.....	2:15
Lulu, b m (d).....	Alexar's Norman.....	1875.....	2:15
Majolica, b g (r).....	Startle.....	1885.....	2:15
(r) retired, (d) dead, (k) kite track records.			

We present with this article illustrations of various classes of horses. Each one may be taken as one of the best specimens of his kind. The Percheron draught-horse is represented by the magnificent imported stallion, Brilliant, whose get are known and justly held in high esteem all over the country. The running-horse is represented by that grand-muscled, deep-chested animal,

Norfolk, whose long-distance dashes are unsurpassed in racing annals. The trotter has for his exponent that marvelous three-year-old, Axtell, whose performance at Terre Haute, has been surpassed by only two horses, and never equaled by a trotter of the same age, being only 3¼ seconds higher than the best time ever made by any trotting-horse of any age. The carriage-horse is represented by the imported French coach stallion, Indre, a prize winner at the Paris exposition. In connection with the breeding of fine horses it may be well to state that the largest breeding farm in America is "Oaklawn" (owned by M. W. Dunham), at Wayne, Du Page county, Ill., where many of the finest horses of the country have been bred. There are, however, many other breeding establishments in the United States, for the fondness for fast horses has come to stay.

Stable Management.—In treating of this part of the subject, it is assumed that the stable is in a healthy situation, for in an unhealthy one trouble or expense will be simply thrown away. Horses dislike bad smells; the drainage of the stable should therefore be well looked to, and the traps should be as far from the stable as circumstances will permit. The pit for the reception of the manure and foul litter, which should be constantly removed, should also be some distance from the stable.

Stalls should not be less than six feet wide; if three inches more can be had so much the better. The partitions should be long enough to prevent horses kicking each other, and high enough, toward the head, to prevent them biting one another. Some authorities recommend that the partitions be so arranged that horses cannot see each other; it makes them restless they say. The soundness of this advice is open to question; it may perhaps hold good with regard to race horses; but the horse is fond of company, and certainly horses that are driven together, or ridden in company, seem to like the society of their fellows in the stable, while a stable companion is useful to lead young horses over fences in their early attempts at leaping.

In dealers' stables the floor of the stalls often slopes considerably from front to back. This makes a horse look bigger than he really is, but it throws all the strain of supporting the body onto the back tendons, and should not be permitted in private stables. A fall of two and a half inches is more than enough for the purposes of draining.

As regards the internal arrangements, especial care should be paid to light, ventilation and temperature. A sufficient amount of light is indispensable for the health of the horse. Horses, like men, are greatly influenced by surroundings, and, considering the number of hours in the week spent indoors, a horse can no more thrive in a dark stable than a man in a dark room. Moreover, a horse brought out of a dark stable is much more likely to shy than one whose eyes had not been dazzled by the sudden change from dark to light. Dark stables were once thought to be conducive to good feeding, and to making a horse lie down, but the idea is now exploded. The horse-owner may here be warned against seeking to make up for a deficiency of natural light by having the whole of the interior of the stable whitewashed. To the height of seven feet from the ground the walls should be colored with some neutral tint, that the horse's eyes may not be injured by the glare inseparable from whitened walls. Dark stables encourage carelessness in the groom, the result being an accumulation of dirt; and, even if the stableman be an honest worker, he cannot see to clean the floors and corners properly unless light be freely admitted to the building.

In the ventilation of stables many theories have been

propounded, and many appliances suggested, but most of the latter have failed from letting in cold currents to a greater extent than they let out the foul air. In nineteen cases out of twenty, the ventilation of private stables consists of holes in the brickwork. In using these it will be found advisable to have thin pieces of zinc, with felt edging to prevent noise, and with easy working hinges, nailed outside the wall, to act as valves; then should the wind set from the quarter in which the ventilators are situated, the zinc coverings will be blown against the apertures, and the entrance of cold currents to any great extent thereby hindered. When the stable is empty doors and windows should be thrown open if the weather allow it to be done without reducing the temperature too much. These remarks on ventilation apply chiefly to smaller stables built in the vicinity of a dwelling-house; in the case of stables built in open spaces, for the reception of a large stud, recourse will generally be had to the advice of a civil engineer on the question of ventilation, but even then experience has shown that the difficulty will not be wholly overcome. The apertures in the walls for the escape of foul air, which, being lighter than fresh, ascends, should in no case be less than seven feet from the ground. If the ventilators are lower than this there will be a current of cold air blowing on the horse's body, which would be injurious at all times, but especially when the horse comes in warm from work.

Temperature is of course an important matter, but chiefly so during the colder portions of the year. In summer it is all but impossible to keep stables cool when the thermometer is standing at 80° Fahr. in the shade; still if the situation is favorable to coolness, and the temperature can be kept below 70° , so much the better. During the hunting season, stables may be too warm by accident or from design; they may be overheated owing to insufficient ventilation, or because the groom connects a glossy coat with a stable bordering on tropical heat. About 55° Fahr. is a good mean temperature, but this cannot of course be maintained when the outside air is some 10 or 15 degrees higher; the most that can be done is to keep the temperature up to that point in cold weather. A moderate temperature and moderate clothing are better than too low a temperature with excessive covering, or too high a temperature with but little clothing.

Having mentioned clothing incidentally, it may here be said that the best shape is the ordinary sheet, cut out at the neck, and buckled across the chest; the sheet should be long enough to reach the root of the tail, and should be large enough to buckle easily round the chest; if it be tight the hair will be rubbed. Some people prefer a straight rug that does not buckle, the front being formed of a separate breast cloth. Hoods are only needed when at exercise in bad weather, or when the horse is traveling by railway. Particular care should be taken that the roller does not touch the back bone; the pads should be so placed that there is a clear space of four inches between them, so as to leave a clear channel over the back bone. The neglect of this precaution will inevitably produce a sore back, and, while first of all making the horse shy of being touched, may subsequently make him vicious in the stable.

Regularity is absolutely indispensable to successful stable management; without it, the horse may be subjected to a dozen different kinds of treatment in as many days, a course obviously detrimental to his health.

The engagement of a good groom is the first step. Where there is a stud of ten or more horses, a stud groom will probably be kept, and, as he will not do much work himself—indeed, it is better that he should not—he

should know how things ought to be done, and see that they are done. In small establishments, however, there will be but one or two men; but the head one should be a thorough stableman. The more ignorant he is of the veterinary art the better; indeed, every horse-owner should, in the strictest terms, forbid his servants to administer any drug or medicine whatever without permission; and the owner himself may be advised never to sanction the giving of any physic, but always to seek good professional advice if any signs of sickness are visible.

Stable work should commence early, as soon after 6:00 A.M. as possible. The first duty is to examine each animal carefully, to discover whether any injury has been received during the night from kicking, getting cast, or any other cause. Horses are then fed and watered, the litter is turned up, that which has been in use during the night not being allowed to remain in the stable during the day, and the stable is put in order; exercise succeeds, after which the animals are thoroughly dressed, but the dressing should never be performed out of doors. Feeding takes place again at 12:00 noon, 4:00 P.M. and 8:00 P.M., when the horses are done up for the night.

Of the feeding of race-horses nothing need be said here, as their care is a business of itself, with which the private person has nothing to do.

Oats and hay form the diet upon which horses are kept, to which beans are added for hunters and horses in hard work; while bran, linseed, and carrots are used for special purposes, in addition to, or sometimes in substitution for, the regular food. Hacks and horses in light work will do well on a daily allowance of eight to ten pounds of oats and ten or twelve pounds of hay. Beans, which contain about 30 per cent. of nutriment, are heating, and should be given only now and then in small quantities. The oats are best divided into four feeds, and beans when used should be given at the midday and last feeds. A handful or two of chaff is useful with each feed, as it compels a horse to masticate, but in many stables there is a prejudice against it, and the hay is put into the rack four times a day, not more than three pounds being given at one time. Oats should be bruised; but, as they soon turn sour, it will be best to bruise every morning only as much as will suffice for the day's consumption.

Bran is indigestible, but it is a laxative, and, so far as hunters are concerned, it is only given in the form of a mash after a day's hunting, and on Saturday nights. To make a bran mash, put half a pint of linseed in a pan, pour a quart of boiling water upon it, and let it soak for four hours; then take about two and a half pounds of bran and mix with it enough hot water to saturate it; stir the linseed composition into this, and it is fit for use. Should the mash be put in the manger, the latter should be scoured out with hot water afterward, or the sourness of the remains of the mash will make many horses refuse their corn.

A few carrots, which must be carefully washed and scraped, given every now and then, are useful as tending to keep the blood in good order, and checking any symptoms of fever induced by the dry food upon which horses live.

Maize or Indian corn contains so small a proportion of nutritious matter that it is not fit for hunters or for horses from which fast work is required.

A correct system of watering horses is no less important than proper feeding with dry food. Many grooms, in their horror at giving too much, fall into the opposite extreme, and stint the horses under their care to an extent that is positively cruel. The result of such a system is fever in various shapes, and a general loss of condition. There has of late years been a growing

tendency to favor the plan of letting horses have access to water at all hours of the day and night, and experience has shown that the effect is beneficial. A separate tank in the stall or loose box is fed by a tap, and a constant supply should be kept up. If a horse watered on this plan be watched, it will be seen that he never takes more than a very few small mouthfuls at a time, nothing like the quantity allowed by the most stingy groom; and, if the amount consumed be measured, it will be found that, after the first day or two, the horse actually drinks less than when watered at stated intervals. Where the *ad libitum* plan is not adopted, horses should be watered four times a day. Nothing can be more unwise than the undue stinting hunters of their water on hunting days; no one could expect a satisfactory day's work from an animal suffering from excessive thirst. Where horses can have water when they like, it will scarcely be necessary to do more than to put the cover on the water tank at about 9:30 on hunting morning, assuming the meet to be at 11:00. It need hardly be said that the quality of water supplied to stables should be carefully attended to. Horses are easily made sick by impurities, and are very dainty in their choice of water. When on a journey, horses should never be allowed to drink at public troughs, as disease is very likely to be contracted by such a proceeding.

Exercise is a great preservative of health, but, like food and medicine, it should be given at proper times and in proper quantities. Exercise must not be confounded with work; the severe work horses are sometimes called upon to perform takes much out of them, and exercise is one of the means adopted to counteract any ill effects of hard work. In order that the muscles of a horse may not become prematurely tired, it is not sufficient that they should be violently taxed some three days a fortnight as with hunters; they must be used every day, and the exercise by which this is effected causes all the tissues of the body to receive their support by reason of the tone given to the circulation of the blood. Hacks, harness horses, and particularly ladies' horses, should be sufficiently well exercised to guard against an excessive exuberance of spirits; for nothing is more annoying than to have an animal, quiet enough in an ordinary way, perpetually jumping about at the approach of vehicles or other horses, merely because he is too fresh. Hunters should have two hours' walking exercise daily; sometimes a slow trot of three or four miles may be indulged in, but, when the hunting season fairly sets in, and horses are hunted regularly, cantering should be forbidden at exercise unless either master or man happens to be a very good judge of what kind of exercise a horse requires.

Horsemanship.—The first step in horsemanship is to mount a horse; but for the performance of this apparently simple feat no fixed rule can be laid down for the guidance of the civilian. Having taken up the reins, the rider should stand at his horse's near shoulder facing toward the tail, and in that position hold the stirrup with his right hand for the reception of his left foot. By standing at the shoulder the rider is out of harm's way in the event of the horse kicking while he mounts. It is perfectly easy to carry out these directions when the man and horse are both of middle height; but it is simply impossible for a short man to mount a horse of sixteen hands high in such a manner; he must risk the kick and stand where he can reach the stirrup—behind it. Having gained the saddle the necessity arises for seat and hands. The fact that the seat of a civilian rider must vary to some extent according to the size and shape of the animal upon which he finds himself does not preclude certain principles from applying in the formation

of it, and it is toward the proper understanding of these principles, and the adoption of the right position of the legs and body, that good instruction is desirable at the outset.

The great desideratum in a seat on horseback is that it should be firm, and this for two reasons. In the first place, a rider with an insecure seat is apt to be thrown by any unexpected movement the horse may make, such as a slight stumble or shying; and secondly, without a firm seat the acquirement of good hands is well nigh hopeless, because when the balance is once disturbed, the rider will have to depend on something else for the maintenance of his seat, and this other means of support will generally take the shape of "riding the bridle," a practice as much opposed to good horsemanship as it is injurious to the horse's mouth.

Having gained the saddle, the rider should seat himself in the middle of it, and should never allow any part of his person to overlap the cantle, as is but too often seen. Many rules are given for adjusting the stirrups to the proper length before mounting, but in practice they are not to be depended upon—first, because all men are not made in quite the same proportions; secondly, where two men are of equal height, the man with the thicker and rounder legs will require a shorter stirrup than the one with lean and flat legs; and thirdly, men of any build will need a shorter stirrup on a wide horse than on a narrow one, besides which, if a horse pulls at all, another hole or two will give the rider additional power over his animal. The proper length of stirrup, then, cannot be satisfactorily ascertained till the rider is mounted. Sitting well in the middle of the saddle, the thighs being turned in, and the heels drawn somewhat back, the stirrup leathers may be let out or taken up until the tread of the stirrup is on a level with the inner ankle bone, and at this length, when the rider stands up, his fork will clear the pommel of the saddle by about three inches. For maintaining his seat the horseman should depend upon his thighs and knees, and not upon the knee and calf only; at times, of course, when on a restive horse, every available muscle may have to be brought into play, but the proper rule is as stated. Some people say they ride by balance only, and others that they ride by grip; a proper seat should be an admixture of the two: a man riding by balance only is sure to be kicked off, while to grip with all one's might during an hour's ride is to undertake as much exertion as should last for a whole day. The position of the foot exercises some influence on the security of the seat; at one time it was thought proper to turn the toes in and depress the heel, a posture that tended to diminish the grip of the thighs, but now the toe should be turned a little outward, and but very little upward. A good seat on a horse should not be strong merely; it should be as graceful as the make and shape of horse and rider allow; but it should not be a stiff, stuck-up seat, which is never graceful, because it is not natural. Above the loins the body should be loose, so as readily to adapt itself to every motion of the horse; but it should be upright, for if the rider lean forward in his saddle, a false step on the part of the horse is very apt to send him flying over its head. The position of the hands has a great deal to do with the seat, but the hands and the reins will be treated of presently.

Beginners are often advised to learn to ride without stirrups; if they do, they should have no saddle either, for riding in a saddle without stirrups is likely to produce rupture. The soundness of this advice, however, may be questioned, because, although riding without stirrups will undoubtedly tend to a firm seat, it will not be one of the same sort as when stirrups are

used; there must therefore be a process of learning and unlearning. The better plan is to practice both ways concurrently. Thus let the pupil be properly placed in a saddle with stirrups, and when he has ridden half an hour let a cloth be substituted for the saddle for about ten minutes, care being taken to observe the rules already laid down for the position of the legs; in this way the proper seat will be strengthened, instead of a new one being formed.

The proper adjustment of the reins is the next thing to be attended to, and as the management of these depends so much upon the seat being firm and independent of the bridle, the acquisition of a firm seat is certainly half way toward the acquirement of good hands. Assuming a single rein snaffle to be the bridle used, the second, third, and fourth fingers of the left hand should be inserted between the reins, which should be drawn up gently with the right hand until the rider feels that he has got an equal hold of his horse's mouth on both sides, and with just so much pressure that the slightest movement of the left or right rein would cause him to turn to the left or right respectively; the fore and middle fingers of the right hand should then take hold of the right rein, which may be drawn out from the left hand so as to enable the hands to be held about four or five inches apart. The arms from the shoulder to the elbow should hang naturally close to the sides, and the arms from elbow to wrist should be about parallel to the ground, the wrist being kept loose, so as to yield gently with every motion of the horse. The rider sitting in the position described, square to the front, with his shoulders well back, is to be riding with fairly long reins, one of the secrets of good hands; if he stoops forward and carry his bridle hand at some distance in front of his body, so as to take a short hold of his horse's head, seat and hands will both be bad.

When a double-reined bridle is used, the third finger of the left hand should be first inserted between the snaffle reins, and then the little, third, and second fingers should be between the curb reins, the two outside reins will then be the curb, and the two inside ones the snaffle. In this manner of holding the reins the snaffle is not so likely to slip, while the curb can be easily slackened or drawn tighter. As military riders invariably use the curb only, the position of snaffle and curb as just explained is reversed in the cavalry service.

When the horse is in motion, the hands should not be kept in one spot, so as to act like the peg on the pad of a harness-horse to which the bearing rein is fastened, as the mouth would thereby become dead, and the horse would lean unpleasantly on the bit; but the rider should give and take, so that while the pressure is not stronger at one moment than another (unless there be a reason for it), yet, on the other hand, the hold should never be entirely relaxed.

In order to encourage the horse to walk, the head must not be confined, but the light feeling on the horse's mouth must be kept up. Should the horse break into that uncomfortable pace, a jog trot, which, by the way, a well-broken hack should not do, never snatch at his mouth, but restrain him gently. To trot, press the legs to the saddle, raise the bridle hand a little, and urge him, if necessary, with the voice. The rising to the trot should be performed easily; the legs must not swing backward and forward, nor should the hands be jerked up and down, while the action of the rider should be in perfect time with the motion of the horse, or a passer-by may remark that the horseman is riding faster than his horse. To start in the canter take up the curb rein a little and turn the horse's head slightly to the right, at the same time pressing the left leg behind the saddle; the horse will then lead with the off fore leg, which is

generally preferred under ordinary circumstances; but a well-broken hack should be taught to lead with either, and if he be cantered in a circle to the left he must lead with the near leg, as otherwise an ugly fall is likely to result from the leg being crossed. Galloping is a pace not generally indulged in by hack riders; when it is, the hands should be kept low, the body thrown back, and an extra grip taken, as nearly all horses pull more or less when extended.

HORSE-SHOEING. That in a state of bondage, as a burden-carrying animal, traversing hard roads, the horse must necessarily be shod to prevent a foot-wear beyond the powers of nature to recuperate is now universally admitted. In other words, horse-shoeing is a necessary evil. In a state of nature the hoof is by attrition and wear kept in such a condition that the strain of the animal's mere bodily weight is properly distributed, and the lameness which often results from improper shoeing is obviated. Any deviation from this natural position and conformation of the hoof must result in harm to the animal, and hence it becomes a question of prime importance to discover what is the true position of a horse's hoof, and of what relative value the various parts are to each other, and what office each portion of the hoof performs. This question is best solved by a careful study of a hoof from a young horse which has never been the subject of the art of the farrier, and the best individual specimens are naturally those of colts which have ranged in upland pastures. The great question which divides the authorities on horse-shoeing is as to the office of the frog—one party maintaining that the frog of the foot bears an equal share with the walls of the hoof in sustaining the weight of the animal, and the other side declaring that only the walls are involved in the fulfilment of this function. Both sides of the question have many eminent advocates. Laying aside for a time the discussion of the merits of either position, we lay down the broad proposition that the true art of horse-shoeing consists in so arming the hoof with iron that the natural offices of its parts may not be interfered with, that those parts which nature designs to protect shall be protected, and those parts intended to bear the strain of the animal's weight shall be so covered as to allow that function to be performed without undue stress on one part and undue exemption on another. To recur to our inspection of a hoof in a state of nature: The hoof of an upland pony is found to be surrounded by a dense, tough horny wall. The growth of the horn at the heel is marked; in the quarters there is a decrease of the growth, and at the toes is exhibited the greatest growth. If course we speak only of the *downward* growth of the horny substance. It will thus be seen that the form of a horse's foot is in so far analogous to that of the foot of a man. It has a toe, a hollow, and a heel; and the heel and toe bear the main stress of the animal's weight, *i.e.*, speaking of the external structure of the foot alone. The terminal bone of the horse's foot and leg is the coffin bone, which the horny wall incloses. To this coffin bone are attached the extensor and flexor tendons, and it is furnished on its superior surface with ridges of bone to which are attached an expansive tough cartilage, which dovetail into horny ridges on the interior surface of the horny wall of the hoof. This cartilage and their horny attachments are technically called the "sensitive" and "insensitive" laminae, and upon them depends the entire weight of the horse. This discovery, demonstrated by eminent veterinary surgeons, goes to show, in connection with the peculiar growth of the horse's horny hoof, that the outer walls of the foot are the main factors in bearing the horse's weight. Having reached this point, veterinary surgeons began to inquire into the

office of the frog. The frog is located nearer the ground than the sole of the foot, and is much more spongy and elastic in its tissue.

It is joined to the sole by thin commissures (ridges) of horn, and this structure of the foot admits of a lateral expansion of the foot at the heel, rendering the hoof much more elastic and able to resist concussion. But this is not the only provision of nature to destroy or minimize the concussion on a horse's hoof in running. The "sensitive laminae" are found to be elastic and compressible, their variation in size under pressure and free from pressure being nearly one-quarter of an inch, and as there are 700 of these laminae in a hoof, the result is a wonderful elastic cushion between the end of the leg and the external hoof. But to render this arrangement yet more effective, if the weight should be sufficient to cause expansion of the foot to such a degree as to enable the frog to touch the ground, the very fact that it does touch teaches us that it is intended to act as a soft cushion between the ground and sole of the foot, destroying and overcoming the last vestige of shock which the insensitive laminae and foot expansion had left to be overcome. These facts being established, we next consider how we shall shoe a horse to preserve these conditions intact, and we deduce, first, that the wall must be perfectly level—i.e., that no more shall be taken from one side of the foot than the other; and this is determined by measuring from the ground to the coronet (where hoof joins skin) on each side of the heel, care being taken to repeat such measurements all around the hoof at points opposite each other, the distance from the ground to coronet being made to agree at any two points on opposite sides of the hoof. Next the hoof must be balanced, or in other words from a line drawn through the longer axis of the frog, the measurements to points opposite should be the same on both sides of the foot. This means simply that the line drawn longitudinally through the frog must at all points be the longitudinal center of the entire foot, or divide it into two exact halves. Next the paring of the walls at the heels and toes demands attention. This should be done with due regard for both tendons and bones. If the heels are allowed to grow too high the main strain is thrown on the bones, while if the toes are too high the tendons suffer in like manner. If one heel is higher than the other corns result, as they do also from too long toes sometimes. Long toes are also liable to produce a rupture of the tendons from the cannon bone, an accident ruinous and incurable. No arbitrary rule can be given for regulating the height of heel and toe. This knowledge must be the result of long experience, and the work is done when done intelligently with due regard to the inclination of the pastern joints, which vary more or less in almost every individual horse. The only general rule to be laid down is that the line of the inclination of the axis of the pastern and that of the hoof should correspond. In regard to paring the frog of the foot, it is imperatively insisted by the best authorities that the frog shall not be touched except to remove ragged edges. Paring the frog is reprehensible enough to cause the instant discharge of a workman guilty of such an offense. As to the sole, various opinions exist as to the advisability of paring it, but the best authorities generally coincide in the doctrine that the sole should be pared to correspond with the concave form of the part generally seen in young horses. The condition of the sole is largely dependent on the wall of the hoof. The only general rule that can be given on this point is that the sole should not be allowed to touch the shoe unless the wall be too weak to bear the strain of the horse's weight.

The various patents of horseshoes are numerous,

many worthless and a few good. Among the good may be mentioned Bonner's four-calk shoe, Charlier's Periplanter, Roberge's Rolling-motion Ball shoe and Harris' Centennial Wing-heeled shoe. Two things must be insisted on by the horse-owner. One is that the shoe shall be as light as possible, and the other, that it shall be held on by as few nails as will answer the purpose. Five nails will answer for saddlers and carriage-horses, and seven will be ample for heavy draught-horses. The nails should be hot-forged, and should be driven with a low inclination rather than high up in the wall; for in the latter case there is a great danger of wounding the sensitive portions of the foot. If the nail be inferior, it is liable to split, and the splinter will enter the fleshy portion of the foot, and occasion great trouble—lockjaw in some cases resulting. The use of cold rolled or cut nails cannot be too strongly reprobated.

HORSE-CHESTNUT, a genus of trees or shrubs indigenous to North America and mountainous regions in Mexico, New Granada, Persia, North India, and the Malayan peninsula, of the natural order *Sapindaceae* and sub-order *Sapindeae*, having exstipulate, opposite, digitate, five to nine lobed leaves, an irregular campanulate or tubular five-lobed calyx, four to five petals, five to eight stamens, one style, a three-celled ovary, with six ovules, of which three or more abort, exalbuminous seeds, and a smooth or echinate coriaceous capsule. The Common Horse-chestnut, has been stated to be a native of Thibet, and to have been brought thence to England in 1550; it is now, however, thought to be indigenous in the mountains of northern Greece, where it occurs wild at 3,000 to 4,000 feet above sea-level.

The wood of the horse-chestnut is soft, and serves only for the making of water-pipes, for turner's work and common carpentry, as a source of charcoal for gunpowder, and as fuel. The bark has been employed for dyeing yellow and for tanning, and was formerly in popular repute as a febrifuge and tonic. The powder of the dried nuts was at one time prescribed as a sternutatory in the Edinburgh *Pharmacopoeia*. It is stated to form with alum-water a size or cement highly offensive to vermin, and with two parts of wheat flour the material for a strong bookbinder's paste. Infusion of horse-chestnuts is found to expel worms from soil, and soon to kill them if they are left in it.

HORSE-MACKEREL is the name applied to a genus of fishes (*Caranx*) found in abundance in almost all temperate and especially in tropical seas.

HORSENS, a seaport town of Denmark, in the province of Aarhus and amt of Skanderborg, is situated at the head of the Horsens-fjord on the east coast of Jutland, and on the railway from Fridericia to Långaa, 25 miles southwest of Aarhus. Pop. (1901), 22,243.

HORSE-POWER is the name given to the unit in terms of which engineers measure the power of steam-engines, water-wheels, and other prime movers. It is defined to be the rate at which an engine works when it does 33,000 foot-pounds of work per minute, a foot-pound being the amount of work necessary to raise a pound weight a foot high. We must go back to the early history of the steam-engine to discover the reason why this number was adopted. The first steam-engines were employed to drive mills, pumps, and other machinery which had previously been driven by horses; and it seemed natural to express their working-power in terms of the number of horses whose work they were got to accomplish. This led to experiments being made in order to get an estimate of the average working-power of a horse. Several such estimates have been given, all differing considerably from each other; but the one adopted whereby to express horse-power is

that obtained by Boulton and Watt from observations on the strong dray-horses employed at the London breweries working eight hours a day. They found that a horse was able to go at the rate of two and one-half miles per hour and at the same time raise a weight of 150 pounds by means of a rope led over a pulley. This is easily seen to be equivalent to 33,000 pounds raised one foot per minute, and hence the number given above. In connection with this subject it is necessary to distinguish clearly between "horse-power indicated" and "horse-power nominal" as applied to steam-engines. The horse-power indicated is got from an examination of the indicator diagram.

HORSERADISH, a perennial plant of the natural order *Cruciferae* and tribe *Alyssineae*, having radical leaves on long stalks, ovate or oval-oblong, four to six inches broad, about a foot in length, subcoriaceous, crenate or serrate, and coarsely veined, stem-leaves short-stalked or sessile, elongate, and tapering to their attachment, the lower ones often deeply toothed; flowers, which appear in May and June, three-eighths inch in width, in flat-topped panicles, with sepals purplish, and petals white; and fruit a small silicula, which in the climate of England seldom bears seed. It possesses stomachic, diaphoretic, and diuretic properties, and hence is administered in atonic dyspepsia, chronic rheumatism, and dropsies. As a masticatory, or in the form of syrup or infusion, it is used for hoarseness. Gerard speaks of it as an anthelmintic and emetic. Externally applied it acts as a rubefacient; and the juice with vinegar is a popular remedy for freckles. In common with other species of *Cochlearia*, the horseradish was formerly in high repute as an antiscorbutic.

HORSETAIL, the sole genus of the natural order *Equisetaceae*, consists of a group of vascular cryptogam-

ous plants remarkable for its resemblance in general appearance to the phanerogamic genera *Casuarina* and *Ephedra*. The apparent roots consist of underground stems, any portion of which broken off is capable of producing a new plant; hence the difficulty of eradicating them when once established. There are twenty-five known species of the horsetail, and the genus is universally distributed.

HORSHAM, a parliamentary borough and market-town of Sussex, England, is pleasantly situated in the midst of a fertile country near the source of the Arun and on the Mid-Sussex Railway, thirty-seven and one-half miles south of London.

HORSLEY, JOHN (c. 1685-1732), a distinguished antiquary of the last century, the date and place of whose birth as well as his parentage are uncertain. The late Rev. John Hodgson, the historian of Northumberland, in a short memoir of him published in 1831, countenances the belief that he was born in 1685, at Pinkie, in the parish of Inveresk and county of Midlothian.

HORSLEY, SAMUEL, a learned Anglican prelate, was born in London in 1733. He died at Brighton, on October 4, 1806.

HORSLEY, WILLIAM, an English musician of considerable reputation, was born November 15, 1774. He studied in Germany under Hauptmann and Mendelssohn, and on his return to England composed several oratorios and other pieces, none of which had permanent success. In 1868 he emigrated to Australia. He died March 2, 1876, at New York.

HORTEN (KARLJOHANSWÆRN), a seaport town of Norway, in the amt of Jarlsberg-Laurvig, is beautifully situated on the west bank of the Christiania fjord, opposite Moss, and thirty-two miles south of Christiania.

